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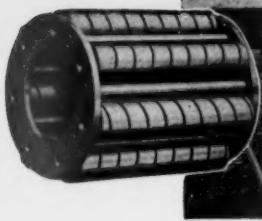
The MINING CONGRESS JOURNAL



Volume 11

AUGUST, 1925

No. 8



Hyatt equipped cars at the West Kentucky Coal Company's Mine No. 10, Wheatcroft, Ky.

Insist on Proved Performance specify Hyatt roller bearings

IN opening No. 10 mine at Wheatcroft, Kentucky, in 1922, the West Kentucky Coal Company, after making a survey of modern mine car running gear, equipped the first cars with Hyatt roller bearings.

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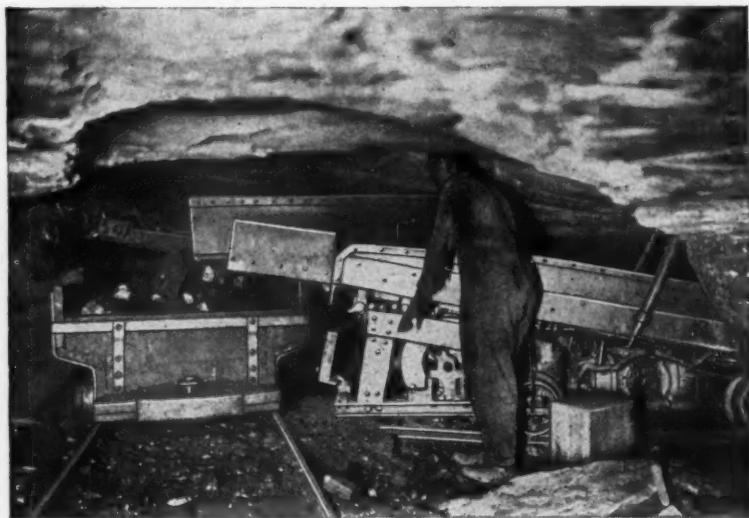
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THE MINING CONGRESS JOURNAL

AUGUST, 1925

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Editor-in-Chief

E. R. COOMBES
Editor

MCKINLEY W. KRIEGH
Assistant Editor

GUY N. BJORGE
Associate Editor

ERNEST H. PULLMAN
Legislative Editor

F. E. PRIOR
Art Editor

E. C. PORTER
Advertising and Business Manager

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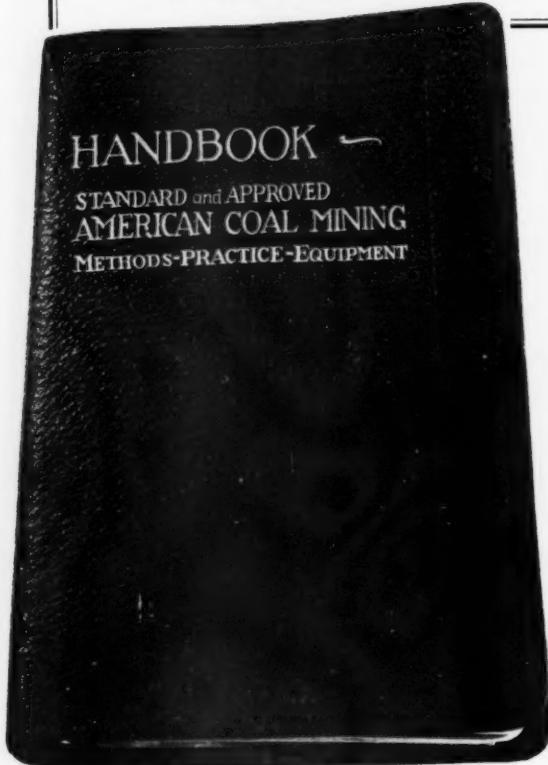
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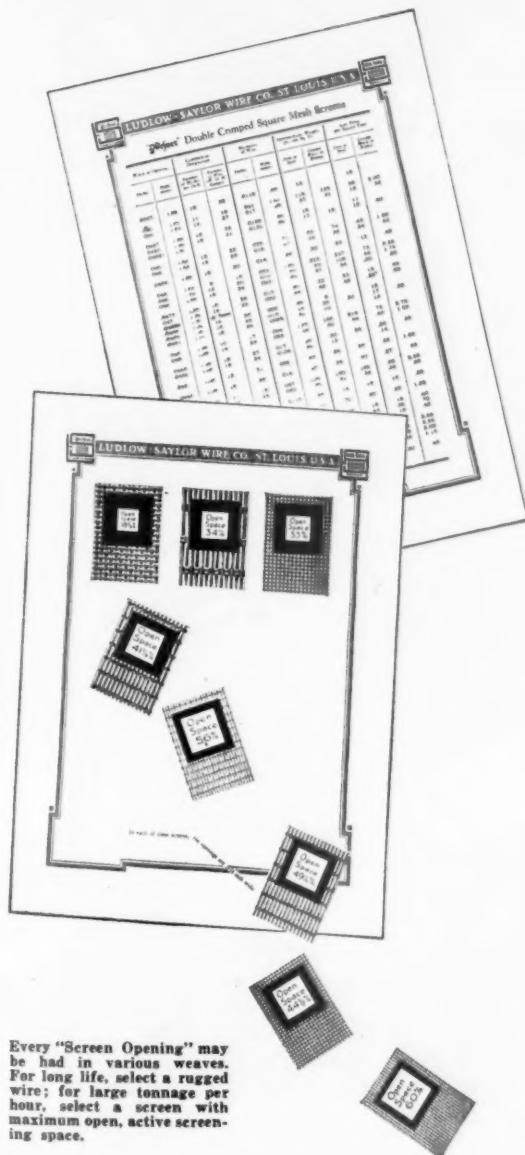
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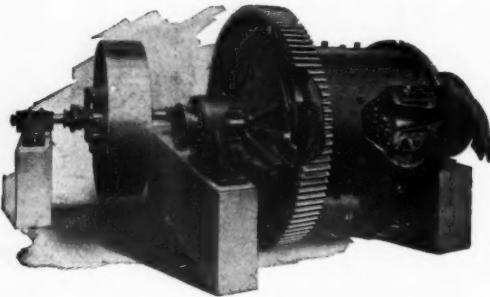
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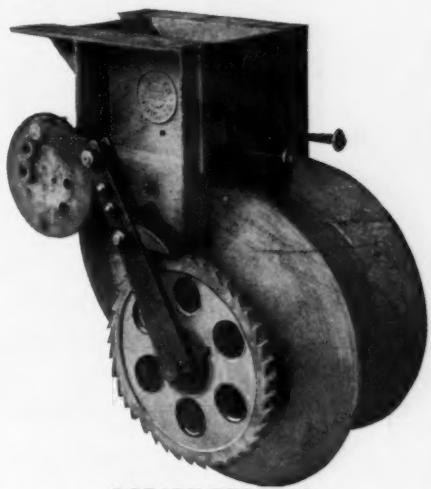


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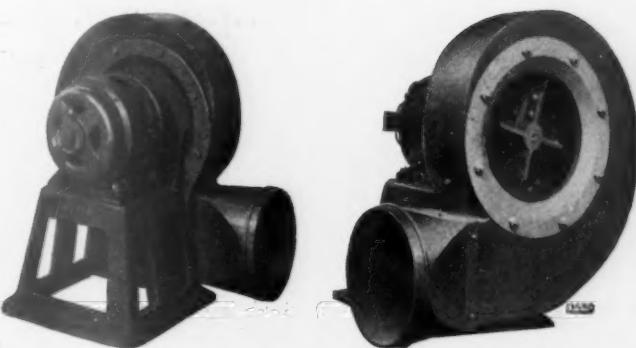
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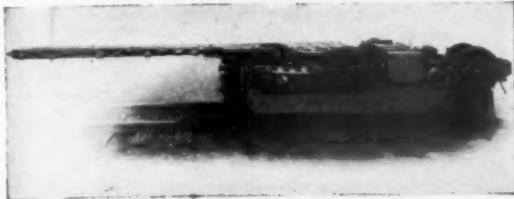
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GENERAL REVALUATION OF METAL MINES

THE income tax regulations provide that no revaluation of a mining property whose value as of the basic date has been determined and approved will be made or allowed during the continuance of the ownership under which the value was so determined and approved except in the case of a subsequent discovery as defined in the regulations or of misrepresentation or fraud or gross error as to any facts determinable on the basic date. But, even in case of misrepresentation or fraud or gross error, revaluation will be made only with the written approval of the Commissioner of Internal Revenue, according to the regulations.

It has been persistently rumored that many mining and timber cases have been reopened, new valuations computed, new audits made, and additional tax liability shown and assessed by the income tax unit, after a lapse of several years from the time the original valuations were made, original audits completed and approved, and the tax liability determined, approved, assessed and paid; and that, while these cases were reopened on the ground that gross error had been made in the original adjustments, the revision of the valuations, audits, and tax determinations was accomplished without the specific written authority of the Commissioner which is required by the regulations. Whether or not these rumors are true as to any large number of cases, a recent memorandum, submitted by the income tax unit to the Commissioner with respect to revaluation of silver mines, contains the following remarkable paragraphs (italics ours):

"The sole recommendation made by the Income Tax Unit with respect to the proposed revaluation of silver mines, is that silver mining properties should be valued in a manner *consistent with the valuation methods developed and in use by this office for the valuation of other types of metal mines.*

"In paragraphs following there will be discussed, factor by factor, *the principal elements affecting a determination of the value of a mine by the discounted profits method, without special reference to the proposed revaluation of silver mines, which the Income Tax Unit believes are universally applicable. If the proposed revaluation of silver mines is finally approved it is understood that these principles will apply.*"

The discussion of the principal elements affecting determinations of value as viewed by engineers of the Income Tax Unit will not be reviewed here. What is considered more important than the Unit's views on valuation factors, on which the Commissioner's approval is sought, is the apparent effort to secure by indirection and implication authority for revaluation of any metal mine or class of metal mines in cases where, in the opinion of engineers of the Income Tax Unit, the original valuations are not "consistent" with other valuations. The principles and methods outlined in the memorandum, "which the Income Tax Unit believes are

universally applicable," have not been applied universally or consistently due to the fact that the Unit heretofore has not attempted to give any valuation method universal application, but, on the other hand, has continually changed its methods for determining valuations of mining properties.

The principles and methods now proposed are novel in many respects and represent changed views and opinions on the basic and accepted principles of valuation as practiced in the mining industry.

The use of the language above quoted in seeking the approval of the Commissioner for revaluation of silver mines indicates that the Income Tax Unit may be seeking blanket written authority for revaluation of metal mines in order that any past or future revaluation shall not be in violation of the regulation which requires that revaluation will be made only with the written approval of the Commissioner. If this interpretation of the language of the memorandum is correct, it is a serious matter, affecting not only all taxpayers engaged in silver mining but all those engaged in the mining of other metals. And if there are any considerable number of cases that have been reopened for purposes of revaluation without written authority of the Commissioner, as required by the regulation, or even if there have been a few cases of this kind, the facts should be called to the attention of the Commissioner and the Income Tax Unit should be compelled to explain why such action was taken in the absence of such written authority.

The attempt of the Income Tax Unit to secure approval of a standardized set of rules for the determination of values of metal-mining properties also is a very serious matter and is open to question and careful consideration. The law provides that the allowance for depletion shall be reasonable "according to the peculiar conditions in each case." It will be seen that the law itself requires that the mode of fixing the depletion allowance shall be flexible and adapted to each case. Therefore, any effort to secure approval of a method of valuation for depletion purposes that may be applied arbitrarily and without regard to the peculiar conditions in each case, is without warrant of law. Even if the Income Tax Unit shall contend that the principles and methods which it now believes to be universally applicable are adaptable to the peculiar conditions in each case, the fact that original valuations, made before the Unit worked out its proposed valuation plan, are not consistent with this plan, can not possibly constitute gross error or justification for a blanket revaluation of metal mines in order to place all valuations on what it now terms a "consistent" basis.

However, the principles and methods outlined in the Unit's memorandum can not be accepted by the mining industry, and it is not believed they will be approved by the Commissioner for universal application. And if the language of the opening paragraphs of the memorandum, above quoted, are intended, as it appears, to

secure written approval of the Commissioner by indirection and implication of unauthorized revaluations made heretofore or to be made hereafter, it is imperative that the Commissioner shall clearly define, in his decision on this matter, his attitude with respect to the reopening of cases for revaluation purposes where specific written authority, as required by the regulations, has not been secured. The taxpayers are entitled to a clear statement of the Department's position in this regard in order that there shall be no further uncertainty and harrassment in connection with the adjustment of tax liability on account of so-called blanket authority for the universal application of the Income Tax Unit's revaluation plan.

TRADE ASSOCIATIONS AND THE SHERMAN LAW

THREE is but one form of government under which the right can be immediately put into effect. An absolute autoocracy can immediately declare and put into effect the right, the wrong or any gradation between. So long as that autoocracy retains its power, its declaration is the law and must be accepted. Autoocracy always provokes revolution. Six centuries of revolutions against autoocracy led up to the Magna Charta, which guarantees individual rights. This was a compromise between autoocracy and democracy. Its continuance required the maintenance of a certain balance of power. Out of it grew the belief that the best guard against the disturbance of that condition could be provided by a representative democracy.

The American Constitution was developed as the best answer. Under it the will of the majority, determined under expressed conditions and limitations, called for acceptance. The process of reaching these conclusions has been and must be tedious. To meet changing conditions created by the individual and collective inventive genius in the mechanics of production, distribution and exchange, requires renewed determinations as to what is right under the changed conditions.

The Sherman Anti-Trust law was hailed as the panacea for the growing interference with the competition which was regarded as the price safeguard of the people. It has been the basis of more litigation than any other law ever enacted. It took many years to reach the real reason as laid down in the Standard Oil case. In the meantime a new factor, the trade association, as a means of cooperative effort, came into existence. While it may not be so understood, its purpose was to make possible the intelligent conduct of the line of business which it represented. Such intelligent conduct required a knowledge of supply and demand to enable it always to operate with such efficiency as would create a sufficient production at a reasonable price to meet all demands for given commodities.

It would prevent such overproduction as would glut the market; as would force cutthroat competition; as would bankrupt some and financially embarrass all engaged in the industry. It would induce the overcapacity in one line to engage in some other line in which there is short production, which always leads to high prices to the great detriment of the consumer.

In short, it would intelligently balance industry. It would create conditions under which the supply in all lines of production would approximate the demand in each of those lines. In the past we have largely met that situation through a process of blundering. The trade association would and should meet this require-

ment through intelligence. There should be no enormous overproduction in one line and underproduction in another. If the corn and potato lands in the winter wheat belt shall all be planted to wheat, it would be wise for the farmer in the spring wheat belt to increase his acreage of corn and potatoes rather than by increasing his wheat acreage to over supply the wheat market, bring financial embarrassment to all wheat growers and cause a shortage in the corn and potato supply to the great detriment of the consumer.

The efforts of trade associations to disseminate this information has led to prosecutions under the Sherman Anti-Trust law which up to the very recent past has prevented them from the accomplishment of this wise and beneficial purpose. It has taken many years to reach an official conclusion that the collection and dissemination by a trade association of facts concerning completed and past transactions is not illegal. The recent decision of the Supreme Court of the United States in the Cement case definitely and satisfactorily determined the right of trade associations in this behalf.

Other questions in due time will be presented to the court. In due time we venture to predict the right will be judicially recognized for every industry to so manage its affairs or to approximate production to demand, to weed out the waste of overproduction and to avoid the waste of underproduction and to enable each individual to conduct his affairs in the light of all information possibly available which relates to his business. In the end, it will be judicially determined that the essence of the prohibition of the Sherman Anti-trust law relate only to conspiracies clearly shown or necessarily implied.

NULLIFYING THE TARIFF

THERE are a number of mineral industries whose existence is dependent on tariff protection, not because of the scarcity of supply or paucity of quality, but because a living wage plus rail transportation in America is greater than a pauper wage plus ocean freight rates from abroad.

If then, a joint ocean and rail freight rate is granted to inland points, on imported minerals, any equalization afforded by the tariff is nullified, and the domestic producer is as effectually handicapped as though no tariff had been placed.

The application now pending before the Interstate Commerce Commission for a reduction in ocean-rail rates on imported English clay, is an immediate illustration. The States of Florida, Georgia, and South Carolina furnish approximately eighteen percent of the clay production of the United States.

This industry has achieved its present standing and future promise, through tariff protection, combined with intensive effort and commendable progress in methods of preparation, and now finds a growing market for its product in the potteries and paper mills of the northern and central states.

A ceramic school has recently been opened in connection with Georgia Tech for the purpose of training ceramists, and still further developing the clay resources of the South. To grant a joint rail and water rate which would create a differential equivalent to the domestic margin of profit, as the proposed rate does, would seriously damage, if not completely destroy this thriving industry in three states, would deprive a considerable number of people of their livelihood, and materially decrease the revenue of the railroads of the South, from clay haulage.

FEARING THE WORST

THE first intimation by the press that the anthracite operators and miners were not likely to come, quickly and easily, to an agreement caused a flutter in political circles. This—if we can trust the statements by the press—resulted in a series of hurried consultations as to what the government should do in the event these gentlemen came to a disagreement and, therefore, in the event of a strike. Of course, our public men mean extremely well when they thus inject themselves into the anthracite situation. If one views it only from their point of view, there is some justification for their worried forethought. In past, such disagreements have been frequent; some of these disagreements have resulted in strikes. On one occasion—in a matter of a century and a quarter—a strike resulted in a real coal shortage. Seeing a disagreement impending our public men fear the worst. A disagreement may end in a strike and a strike may bring another shortage of coal. They argue from the known past to the unknown future. Since the worst may happen, our public men are prone to say that they should take no chances; instead, they should prepare for the worst. While, from their point of view, such reasoning is sound, there are two situations which might well be taken into account.

The first of these is that it doesn't always rain every time a cloud forms. Certainly, every cloud formation doesn't mean a cyclone or a tornado. To rush to the storm cellar every time a cloud forms, smacks just a little of unreasonable jumpiness. In this matter there is abundant reason for taking a more courageous and less fidgety course. The Miners' Union has built up an elaborate record for itself, which record tends to establish its character as a blusterer. It implies no unkindness toward Mr. Lewis of the miners to say that he is at the head of a body of gentlemen, not all of whom are industrial statesmen actuated by the highest motives. Instead, some few of them are dominated by a purpose to get by bluff what they want. Being committed to the theory of bluff, they are prone to be noisy in their negotiations with the operators. In the early stages of their wage negotiations, these men bluster and prove threatening. But, when they rant and use violent language, the nation is not warranted in jumping to the conclusion that they are about to go to war. Many a stormy session in a wage conference has ended in nothing more than a harmless gust of wind. That is a fact which the gentlemen in the government might do well to take into account. Specifically, it is never safe to judge the final outcome of a wage conference by what is said at the opening session. On such occasion, the miners are merely delivering themselves of pent-up oratory which has been accumulating in their brains through weeks and months. Specifically, the miners are quite human. They must explode occasionally. They are not always as vicious as their words indicate and as the public press sometimes pictures them to be. The government will make a grave mistake if it takes too seriously the first oratorical outbursts of a coal wage conference.

Before volunteering as mediators, it might be well for our public men to ask themselves soberly what must be the consequences of their action. As we have shown, the miners do not take this harsh oratory seriously; the operators never have taken it seriously. In both of these circles, it is accepted as mere jockeying for position. But, if this is interpreted by the press and the government as expressing a fixed purpose and policy of the Union, the chances are that the Union finding it has won two imposing audiences will adopt it as the policy

of the Union. Then we will have a strike when none was intended. For that reason, volunteer mediation is likely to have an effect which neither the miners nor the operators expect or intend. It would prove unfortunate, therefore, if our public men should act with precipitation and without giving full weight to the psychology of the rough-play preliminaries of all wage conferences in the coal industry. If they will wait until the preliminary outbursts of the conference have spent themselves, they will be on far safer ground.

THE POWER TO COMPEL

NY announcement by the Government of its intention to take a hand in the anthracite situation must carry with it the inference that there is something definite which the government can do to force a solution. It must be assumed that no public official would promise or threaten to do something unless he was convinced that he could do it. To do otherwise would be to put the government in an extremely embarrassing position. The practical question is: What can the government do? Reducing the whole broad question to the focal point, can the government force one miner to work if he does not want to do so? Can it force one operator to allow others to experiment with his mine? In an attempt to break down that wall, the Coal Commission made a detailed study; others have struggled for years to find some power resident in the government by which a public official may compel anybody to do anything. Indeed, if that power had been found, it would have been discovered at the same time that the Bill of Rights had been repealed. The Coal Commission assigned some of its keenest engineers and attorneys to the task of locating the government's power to compel individuals to act in industrial matters. The students met their first difficulty when they attempted to extend the federal power over matters falling under the police powers of a state. They found that, under the Constitution, the federal troops are barred out of the state until the governor and all of the administrative forces have made public declaration that a situation is beyond their control and have called for federal assistance. Therefore, before federal troops can enter a state, federal intervention must be invoked by the governor.

Assuming that this preliminary step has been taken, and that the federal troops were actually encamped in the mining region, the students next inquired as to how they would proceed to get the desired coal. They realized that the troops could not compel a man to work as a miner if he didn't want to work. Also, the mine is owned by a private citizen. If he does not consent to have his mine operated by men who are unfamiliar with it and whose ignorance might ruin it, there is no power anywhere which can compel him to do so. If the federal government wants to exercise its right of eminent domain and take over the mines, it must first appraise them and then compensate the owner for them. To do that would involve such an elaborate procedure in the courts that any ordinary strike would be at an end long before the laws had been complied with. As a matter of fact, the Coal Commission satisfied itself that any attempt to resort to force is an idle gesture.

If the government cannot compel and if it tries to act effectively, it must fall back upon mere moral suasion. That raises the politic question: "When is the time ripe for the exercise of that force?" As we have indicated, the government is likely to do far more than good if it inserts itself at a time when these gentlemen are merely indulging in meaningless oratory. In addition to being premature, federal intervention under any cir-

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cumstances can only encourage the miners. If that is the result, the event has been influenced contrary to the best interest of the coal consumers and the operators. Taking everything into account, precipitate action by the government seems extremely ill-advised.

A REASONABLE EXPECTATION

WHILE fully conscious of the natural difficulties are inherent, the coal operator complains that for the last eight or nine years he has not been able to devote any time to constructive activities. Instead, he has been compelled to spend all of his time to resist the encroachments of others who think they have a call to interfere with his affairs. He does not feel that this intrusion by volunteers is fair; nor is he willing to admit that the circumstances justify it. It isn't a pleasant subject and the operator hesitates to discuss it, but the facts are that, in those eight or nine years his time has been commanded increasingly to offset the advances made by various groups in the government which wanted to inquire about the way in which the coal business is conducted. This has required that the operator spend a generous amount of time discussing and explaining the coal business to committees of Congress, the Federal Trade Commission, several departments of the government, taxing authorities, state legislatures, and the various departments of state government. Each of these had assumed a critical attitude—a very easy posture, by the way. To break down the criticism required often an elemental discussion of the obvious. Thereafter, it was necessary to curb uninformed imaginations which wanted to turn themselves loose on coal.

As a preliminary to all these discussions, the operator has had to go into conferences with his own associates and hence to devote much valuable time to the organization of his own associations. Thus, between the need to overcome the natural processes of destruction in his own business and the need to discuss the public relations of his industry, the average operator has found every moment of his time absorbed. Thus he has left him practically no time to give to serious consideration of those things in his own business which make for profit and improvement.

While the operator was thus preoccupied, the consumers of coal and those who translate coal into other products, have not been similarly engaged. They had no problem in public relations to require their attention. They have had to resist no interference by any long and imposing line of governmental agencies. As a result, the consumers of coal and those who translate coal into other products have been free to devote their time to the improvement of coal processes. For that reason, many developments which naturally belong to the coal business have gone out of that industry and into the hands of others. No benefit from any one of them has inured to the coal operator or the industry. The rewards flowing from better coal utilization have been reaped by those who are wholly outside the industry. The country has seen a tremendous growth—almost a revolution—in the utilization of coal, but the industry, which supplies the raw material, has not profited to the extent of a penny. The simple reason seems to be that the operators have not been able to find the time to devote to the studies which would allow them to develop these processes and to absorb their benefits.

This explains simply why the operators are pleading that they be allowed a little freedom from interference that they may devote a little time to their own press-

ing affairs and to the improvement of their processes upon which they must rely for profits. It would seem that their request is entirely reasonable.

There is no disposition on the part of any sensible man in the coal industry to suggest that the government should not inform itself, broadly and even in detail, about the coal business. Every operator wants the government to know about coal. But theirs is a reasonable request that governmental inquiries should finally be centralized so that the same question need be answered and debated only once. They believe that the government's method of procedure should be so formulated as to take as little as possible of the coal industry's time away from the coal industry's own business. And, unless this can be done, we must expect that others will make all of the improvements and reap all of the rewards—that the coal industry will stand still because it cannot find time to plan a same expansion.

A BAD SITUATION

THE Senate Committee on Investigation of the Bureau of Internal Revenue expects to offer cures for many of the ills that prevail in the revenue department. If the Bureau's ills are wisely diagnosed and the committee's cures correctly prescribed, the results should be of great benefit to taxpayers who have been harassed by seemingly interminable controversies with the Bureau, and who have incurred enormous expenses in seeking to obtain justice and finality in the settlement of their tax liabilities.

Taxpayers in general will welcome any recommendations that may result in the improvement of the administrative system of the revenue department, particularly recommendations which, if adopted, will simplify the department's procedure, make its policies and practices less arbitrary, and make for certainty and finality in the settlement of tax liability. If the Committee's report and recommendations are confined to this phase of the Federal tax situation, much good may be accomplished.

If the Bureau shall ever catch up with its work so that tax cases may be handled promptly, decisively and currently, the present technical staff of engineers, accountants, and attorneys can be greatly reduced. Therefore, the circumstances may require the application of firm disciplinary measures to compel this technical staff to get down to business and get cases settled. Why should a staff of men voluntarily work themselves out of a fairly lucrative government berth when the present prospects for outside private employment are so negligible?

These considerations undoubtedly have had their effect upon the minds of those Bureau employes who, it is charged, have lain awake nights devising plans and mathematical formulae whereby the copper, silver and timber cases could be held open indefinitely. The whole situation is utterly inexplicable, when viewed in its practical aspects, and it seems almost incomprehensible that such a condition can exist under an intelligent administration.

The majority of taxpayers are as much in the dark about the causes for their continual harassment over taxes as they are about Einstein's Theory of Relativity. In the mining industry especially, it is difficult to understand why practical, common-sense business methods can not be applied in the adjustment of tax liability instead of highly technical and unconscionably dilatory methods such as those under which some sections of the Revenue Bureau function.

REVALUATION OF SILVER MINES STRONGLY OPPOSED

Silver Producers' Association And American Mining Congress Join In Defending Taxpayers Against Proposed Blanket Revaluation And Arbitrary Increase Of Tax Liability For Prior Years—Revenue Bureau Proposes Valuation Plan

REVALUATION of silver mining properties by the metals valuation section of the income tax unit has been deferred by order of Commissioner of Internal Revenue David H. Blair pending his decision as to whether the original valuations shall stand or shall be revised in accordance with recommendations of the metals section.

The action of Commissioner Blair in directing the metals section to defer all action pending his decision will result in automatic extension of time for hearings in individual cases if that decision is unfavorable to the taxpayers. New notices of hearings will be sent to individual taxpayers if the revaluation proposal is sustained.

At the hearings before Commissioner Blair and Assistant Secretary of the Treasury McKenzie Moss, July 13 and 14, the silver producers made a comprehensive and convincing argument against revaluation of their properties. The evidence submitted tended to show that the silver price of 65 cents per ounce, used by the revenue bureau in the original valuations, was a conservative estimate of the expected future price of silver as of March 1, 1913, and was based upon sound methods of price determination.

PROPOSED VALUATION FORMULA

Commissioner Blair opened the hearings by having read to the silver men a statement on behalf of the income tax unit in which the proposed valuation methods to be applied by the metals section, were briefly outlined. This statement did not discuss the legality or effects of revaluation of silver mines, but was confined to a discussion of general principles which the mining men were informed would be adhered to in revising the original valuations.

The statement covered the following factors affecting the determination of mine values by the discounted profits method of analytical mine appraisal: (1) ore reserves; (2) mining and metallurgical recoveries; (3) profit per unit of ore reserves; (4) metal prices; (5) cost of production; (6) working capital; (7) Federal taxes; (8) deductions for capital expenditures; (9) rate of production; (10) interest rate for discounting to present worth.

PRODUCERS MAKE REPLY

In reply, the silver producers informed the Commissioner that the income tax unit's memorandum could not be approved by them as a proper guide

By MCKINLEY W. KRIEGH

for mine valuations. The reply, in part, was as follows: "We can not subscribe to a proposal that would seem designed to subject us to such grossly unfair and inadequate valuations as seem to be the practical results thereof. Were it not for the practical results which we have seen, we might feel that some of the phrasing here used and the failure to



W. Mont Ferry

state certain basic principles was only the result of a hurried preparation of a tentative statement which was to be subject to revision and correction.

"For example, we find with regard to ore reserves four sentences. We find no statement of the fundamental principle that in any determination of ore reserves *due consideration must be given to all geological evidence*. Was it merely an oversight that no reference is made to geological evidence? Or is it the intention to disregard geological evidence where it conflicts with one of the four rules which, if this Memorandum received the Commissioner's approval, might be construed as the only possible bases for such valuation within the department.

"Under 'mining and metallurgical recoveries' reference is made to 'the certain dilution of the ore by waste.' Is this intended to mean that there is always the certainty that ore will be diluted by waste? But that would not always be true, as where sorting or selective mining is used. Furthermore,

we may well ask if the Unit intends to ignore or disapprove all the established principles relating to mining and metallurgical recoveries except those embraced in the three sentences under this caption.

A UNIQUE ASSUMPTION

"Under 'profit per unit of ore reserves' reference is made to 'the assumption that the past spread of profit is the best indication of the future spread of profit per unit of production.' Such an assumption is contrary to fact and opposed to all accepted principles of mine valuation. The past spread of profit is not the best indication of the future spread of profit per unit. The whole series of statements made under this heading we feel is a unique and extraordinary presentation of principles and methods of mine valuation to which we are wholly unable to subscribe.

"The question of metal prices we believe has been fully covered in our prior discussion today. Suffice it to say that we believe the methods are wrong which, in the face of evidence thus presented, would result in selecting 57.78 cents per ounce as the price to be used for silver in the March 1, 1913 valuations.

"With regard to Federal taxes, are we to understand that no attention is to be paid to the ruling of the Supreme Court to the effect that in the computation of a tax, the incidence of the tax must not be taken into account?

"The memorandum makes reference to the mine with 40-year life, for which it is assumed four complete plants will be required. It is not reasonable to assume that an owner of such a mine will take 40 years to exhaust it, building one plant after another has been used up. Rather, he will, if possible, enlarge or duplicate his plant at the outset, which will perhaps double his present value. The Unit should assume that the owner will do the wise rather than the foolish thing.

ARBITRARY INTEREST RATES

"As to interest rates, the minimum percentages named seem reasonable, but there is no intimation in the Memorandum as to the upper limit that will be set or as to the rates that will be used in average cases. We are not sure just what some of the statements mean, and, in view of indications that strange and newly invented conceptions of what the rate should be have been developed and are being applied in revaluation, rates running up to (Continued on page 402)

THE DRIFT IN COAL MINE LABOR

The Miners Bring National Forces To Play Upon A Situation Essentially Local To Anthracite—A Difficult Situation

By GEORGE H. CUSHING

WE HAVE had almost a full month of discussion of the proposed new anthracite wage scale. The present contract expires at the end of August; another contract must have been agreed to or production will be suspended. Although debate has been extensive, the discussion has tended to confuse rather than to clarify the situation. The result is that, at the moment, the two sides of the argument are further apart than they were at the beginning. That is not wholly a new situation where men allow themselves a long time to argue a known disputed point. Also it is not unusual when we know that it is the common practice in American business to go to war as a means of arriving ultimately at peace. Either one of these things might explain the wide divergence of opinion. But, something more sinister has evidently invaded the debate.

At the outset and now one and but one question really confronted the conferees. The operators are the producers of anthracite. The miners are the employees of those anthracite mines. The whole industry is huddled into three relatively small districts in northeastern Pennsylvania. Two years ago these employers and employees signed an agreement covering the wages to be paid in those mines. That agreement is due to expire on August 31. The only question before both miners and operators is: On what terms will, or can, an agreement be reached for some other period in future? Shall the present scale be renewed or shall another scale, naming other terms, be substituted? Those, in reality, were the only questions legitimately and properly brought before the conferees. It must be added and admitted that those questions contained an abundance of material which needs thrashing out without the intrusion of any extraneous subjects.

The agreement which brought the present scale into being was arrived at following the lively interference with the debate in the sessions by the Governor of Pennsylvania. In a manner which since has been considered arbitrary, he granted the men an increase

of 10 percent in wages. That increase was instantly challenged by the consumers of anthracite who are, in the main, grouped in some nine of the Atlantic Coast states and who comprise about 40 percent of the householders of the nation. When these householders found themselves powerless to change

to allow them to maintain what they fondly call the "American standard of living"—whatever that may mean. They want more money. They declare they are going to have it.

This exposition of opposing fundamentals supplies plenty of material for discussion. The miners declare they are underpaid; the operators that they cannot pay the present wage scale and still sell the coal. To iron out those differences and to devise a way around the *impasse* would seem to give enough for any one conference to do.

However, before the conference could settle down to a discussion of the only real question dividing the two sides, this local dispute was suddenly expanded into a truly national controversy by what appears to have been—let us say, for the sake of charity—an inadvertent outburst of impassioned oratory by Mr. John L. Lewis, the miners' president. He declared with more intemperance than the facts warranted that the miners were being deprived of a proper living. Warming to his subject, he said that an attempt was being made to destroy unionism in this country. He then lost control of himself and said that this was a conspiracy on the part of those who control our large financial institutions. To put an end to this oppression, he announced that, if necessary, he would call a nation-wide strike. He used this occasion, as he said, to call this matter to the attention of the public and to the government of

THE MINERS' DEMANDS

The United Mine Workers of America in presenting their demands to the anthracite coal operators stipulate seven major changes which are as follows:

1. *Two-year contract and complete recognition of the union.*
2. *10% increase in wages.*
3. *Uniformity and equalization of all day rates; which shall be equivalent to the average daily earnings of contract miners and which shall apply to dead work. Special (outside trade) rates for skilled mechanics, engineers and pumpmen, time and one-half for overtime and double-time for holidays.*
4. *Where coal is paid for by the car, a ton shall be 2,240 pounds, and present penalties and dockage for refuse shall be abolished.*
5. *Pay for installing all trucks and timbers, extra shoveling, splitting pillars, etc.; special rates for advanced openings; limitation of working places; free tools and electric lamps and batteries.*
6. *Minimum rates of twenty cents per inch for refuse in all kinds of mining up to 10 feet wide and thirty cents for blasting top and bottom rock.*
7. *General improvement in mining conditions including five-day week, and employees operating diamond drills to be brought under the agreement.*

Recommendations: (1) Improved housing, (2) operating of all collieries on part time rather than some idle and some operating full time.

The Union Committee is composed of the following representatives: Rinaldo Cappelini, President, District No. 1; Andrew Mathey, President, District No. 7; Christ Golden, President, District No. 9; John L. Lewis, Philip Murray and Thomas J. Kennedy, President, Vice-President and Secretary, respectively, of the International Union.

the contract or to escape the resultant higher price of coal, they were forced to decide whether they would continue to use anthracite. Many of them decided at once to abandon it. The record is replete with incidents which show conclusively that the movement away from anthracite grew during the life of this wage contract. This acted as a veto by the public of the wage scale. The operators, therefore, are now forced to consider seriously whether it is not true that the wage scale had risen beyond the point where the public will pay it.

In answer, the miners are prone to say that their wages are not sufficient

the United States.

If that speech had been considered in its proper setting, the incident would have been passed over lightly without creating more than a ripple. Mr. Lewis has an unfortunate passion for assertion. He indulges in it rather freely and this indulgence in his outstanding weakness has done considerable damage to his reputation for sober action and conservative leadership. Appreciation of the fact that he was but giving rein to his weakness would have modified the incident to its proper insignificance. Also, the session on the following day of the Scranton convention of miners, before which this

address was delivered, Mr. Lewis caused a resolution to be introduced calling upon these miners to stand for an assessment to fill the war chest of the union. If the speech had been properly appraised, it would have been recognized as a mere "drive" to raise money. That would have softened its effect. In addition, any sort of broad inquiry into the facts would have proved that what Lewis threatened was then impossible. Many of the former members of his union are now, voluntarily, working for less than the Jacksonville scale; they have abandoned the union and have resisted all efforts to recall them to allegiance. The nonunion field never was obedient to his orders, and it is now producing 65 percent of the nation's bituminous coal. Those two groups are beyond his reach. The union mines which still attempt to pay the Jacksonville scale are working but a small part of the time and are making rather a pitiable showing in the great competitive struggle. To threaten the nation with that sort of a demoralized organization was, in itself, a mere display of bombast. And to accuse financiers of conducting a conspiracy when the public was merely looking for and buying the cheapest coal was a palpable attempt to evade or to cloud the issue. If the cold facts had been presented and considered in this light, the incident would, rather quickly, have been passed over. It would have been appraised for what it was, namely, a mere tempest in a teapot—meaning an eruption within Mr. Lewis' cranium.

The taciturnity of the President is known; one of these days it may be proverbial. Events may occur all around him without inspiring or inciting him to speech. This appears to be a characteristic trait. It is one in which the reporters refuse to indulge him; they are governed, no doubt, by the precedents in the presidential office. Thus on the days following the Lewis speech the press mirrored the President as having become as volatile as a broadcasting station. If he had said, about the coal situation, a mere tenth of the things accredited to him in the newspapers of a dozen cities, he must have dispensed with work for a day or so and abandoned himself to such a flow of words as would have fatigued a phonograph. Of course, the President never gave any such an exhibition. However, the press said that he had said

these many things and that was sufficient to give real power to the "threat" that Mr. Lewis had made; it put the Government morally behind Lewis. This had two effects. It served as a call to arms to all the miners in the union bituminous field. And it may have aroused other unions to the defense of their own confederacies. From that moment we began to face a real situation.

Up to the moment when the press said that Mr. Coolidge had taken seriously the outburst of Mr. Lewis, the miners in the union bituminous field were on the point of surrendering to the inevitable and of abandoning the Jacksonville scale. After that incident, they were in the mood of the soldier who smells gun-

more, the operators never had considered it. Still, it was predicted up to the moment when Mr. Warriner assumed his familiar role. These predictions of war were ominous, as showing the drift of public desire—as expressed by the press.

What actually happened was that Mr. Warriner, speaking for the anthracite operators, went, in the first instance, further than he had ever gone at an early stage in such proceedings. At the "hop-off" he announced that the operators were willing to make every effort to reach an agreement; to continue the mines in operation after September 1, in the event they could not agree; to submit all disputed points to arbitration; and to make the award retroactive to

September 1. Few things could have shown a greater willingness to reach toward conciliation—consistent with the imperative necessity to take the active veto of the consumers into the accounting.

The amazing result was that this pacific speech was passed over with little notice. Regardless of the strength of its appeal for peace, it was even, in some quarters, declared to be "weak." When such an effort was so gravely distorted and so wholly misunderstood, the only conclusion left was that the public wanted and was spoiling for a fight; it was not going to be quite satisfied unless it got one. In any event, the Warriner appeal for peace was ignored; instead, attention was riveted upon what the President was supposed to be contemplating in the event of a strike. If, then, we get a strike, it will not be because Lewis has an issue; nor because the operators forced the situation; nor yet because Mr. Coolidge said anything to provoke or encourage it. It will be because Mr. Lewis' tongue ran away with him one night and

because the press and the public took him seriously.

Conditions in the soft coal industry are pretty well exemplified by the situation on the Baltimore & Ohio. There are 1,200 mine openings on this system, and only 250 are working, but these 250 are producing 60 percent of the normal output of the 1,200. All the 250 mines in operation are either non-union or union mines in which the miners have accepted the 1917 scale.

THE OPERATORS' REPLY

The anthracite coal operators in their reply to the demands of United Mine Workers sum up in a very few words the situation of that industry and why it is impossible for them to meet their demands:

1. *Anthracite is not a necessity.*
2. *Miners are at present enjoying more than seven hundred dollars higher annual wage than the average for any other class of workers.*
3. *Because two or three producers show large profits it is by no means a fact that the whole industry is profitable.*
4. *High cost of anthracite last year resulted in loss of substantial markets; one-fifth of the domestic size production was marketed at a loss.*
5. *Labor now represents seventy-five percent of anthracite cost.*
6. *Steam sizes comprising one-third the total output are sold at a loss.*
7. *Opposition to check-off is unabatable.*
8. *Anthracite miners' wages have increased 192% since 1914.*

Recommendations: Because of the difference which now arises between us, you asking for an increase in wages and we asking for a reduction, we wish to urge that provision be made at the outset against the possibility of a suspension on September 1. It can be accomplished by an agreement to the effect that if our respective committees are unable to agree upon any issues, such issues shall be referred to arbitration, upon the understanding that production shall be continued at the present wage scale until the arbitrators render an award.

The Operators' Committee is composed of W. W. Inglis, President, Glen Alden Coal Co., Scranton, Pa., Chairman; Andrew M. Fine, Vice-President, Hudson Coal Co.; Thomas Thomas, General Manager, Lehigh Valley Coal Co.; Jesse B. Warriner, General Manager, Lehigh Coal & Navigation Co.; E. D. Suender, General Superintendent, Madeira Hill & Co. and George Hadesty, General Manager, Philadelphia & Reading Iron & Coal Co. Alvan Markle, of the Jeddo-Highland Coal Company, is Chairman of Joint Committee.

powder; they were ready for a fight.

With that as a preliminary, the events of the opening session of the conference at Atlantic City can be fairly understood. That was a meeting filled with point—if anybody had been in a mood to see the point. But there was a peculiar perversity in the public mind. It seemed to hunger for a warlike demonstration. Thus when the conference was about to assemble, it was heralded that the anthracite operators were to choose as their new chairman a gentleman who has something of a reputation as a baiter of labor. This did not happen; what is

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ROCK DUSTING AS DISCUSSED AT CINCINNATI

The Concensus Of Opinion Is That While Rock Dusting Is Not Panacea For Explosions, It Is Great Ally As Safety Factor And As An Illumination Medium—Its Cost, Effectiveness, And Possibilities Discussed By Leading Coal Mine Operators

ON Friday morning, May 29, coal operators gathered together in Music Hall, Cincinnati, Ohio, for the purpose of discussing the subject of dusting mines to prevent explosions. A. C. Callen, of the University of Illinois, was chairman of the meeting.

EFFECTIVE PRACTICE AND ACTUAL COSTS OF ROCK DUSTING AT THE PITTSBURGH COAL COMPANY'S PROPERTIES

Arthur Neale, General Manager, The Pittsburgh Coal Company, in outlining their experience with rock dusting said:

"At our mines we believe 65 percent of incombustible matter in dusts collected along the roadways and room gobs will prevent coal-dust explosions. We know that coal dust, from any of our company's mines in the Pittsburgh district, that will pass through a 20-mesh sieve will propagate flame and explode, either from gas ignition, blown out shots or electric arcs. Consequently we use stone dust in what we think is a sufficient quantity to prevent propagation.

"About 85 percent of our company's production is undercut by electric-driven chain machines. One of our engineers estimates that 95 percent of the 20-mesh coal dust is made at the working faces and the other 5 percent is made by mules, locomotives and cars crushing the spilled coal along the roads between the face and the tipple.

"We have not had any experience in the crushing and pulverizing of stone dusts, although we have an abundance of limestone of a suitable character conveniently located at many of our mines. There are certain dusts that we believe should not be used in mines. Some of those dusts are very easy to get.

"We began to consider the advisability of using stone dusts in our mines in 1912. We did some dusting under the advice of the Bureau of Mines in 1914, and in 1917 had the Bureau of Mines test and analyze samples of what we call draw slate in the Pittsburgh region.

"It was not until after the 1924 meeting at Cincinnati that we got down to the subject in dead earnest. Dust was bought on the open market from companies handling that material, and we found them ready and willing to cooperate in producing what we thought we needed.

"We were concerned in finding the most economical and thorough method of applying stone dust in our mines after the dust was manufactured. We thought we didn't have time to go into that our-

selves, but we began making experiments in developing a dust-distributing machine, and after making about six different types we agreed upon the machine we now use and with which many of you are familiar.

"The stone dust we buy is a pulverized limestone, about 75 percent of which will pass through a 200-mesh sieve, and all of it will pass through a 50-mesh sieve. The lighter colored dusts are preferred on account of their illuminating qualities. The question of illumination is very important, and one can scarcely believe the

vast difference stone dusting makes on the visibility of objects. We find that the finer we get the dust pulverized the better illuminating effect it has.

"The dust we use costs us about \$6 per ton f. o. b. mines. The cost at the mills is \$4.40 per ton, and the freight rate from there to the mines averages about \$1.60 per ton. I have only seen two machines applying dusts, which are on the market for sale.

"The Legrabon machine sells for \$1,380. It is said to be able to dust 40 feet of entry per minute when 3 pounds of dust per lineal foot is applied. It is propelled by either a locomotive or an animal. At some of our mines we use a small locomotive built from parts of obsolete self-propelled undercutting machines. Where this contrivance is used it is equipped to operate on two speeds, one intended for traveling while not applying dust and the other speed to be used while dusting.

"The Mine Safety Appliance Company of Pittsburgh sells a rock-dust distributing machine for \$1,500. Both of these machines require two men to operate them.

"The dust is fed from hoppers into the exhaust of the fans, which blows the air through a tube to the point of delivery. The hoppers are built to accommodate varying conditions and have different heights to suit different heights of haul-

age roads. Both machines are electrically driven.

"The cost of rock dusting differs considerably for various reasons, such as height of roadways, width of entries, the length of roadway that can be dusted continuously during one shift, the delays due to passing side tracks containing cars and providing a clear road past those obstructions. The cost of dusting, of course, increases when a machine has to be moved a considerable distance between dusting periods. After a mine has been dusted once and the entries advance into new territory the machine has often to be brought back a long distance to dust that part of the workings that has advanced since the last dusting; sometimes the whole entry should be dusted, but the undusted portion should not be required to wait that long before dust is applied.

"Machines should be so constructed that they can travel a fairly good speed while going from one district to another. This will tend to reduce dusting costs as it will permit the dusting operation to begin again promptly.

"While applying dust the machine should be built so that it will travel along at a speed which will permit the application of the proper amount of dust. This is particularly true of the machine fitted with a fixed head for delivering dust. Dusting haulage roads is not a serious problem, but to get dust in entries in which there is no track is a question not so easily solved. We try to dust back entries before the track is removed and while the temporary track is still in place. In old entries we make a hole through stoppings and place the machine there, the dusting head is removed from the machine and a canvas hose, 10 inches in diameter, is attached. Metal elbows are used at bends or corners. The stone dust can be forced into back entries by using a 100-foot length of hose with three elbows. By using this method and making holes through stoppings at 500 feet intervals and discharging 1,500 pounds of dust we can get satisfactory results. This gives 3 pounds per lineal foot and is fairly well distributed.

"I am not convinced that computing costs by the ton of coal produced is the best for our company. Speaking for our district only, I am inclined to think we should use a lineal-foot basis.

"The majority of our entries have an area of about 55 square feet and a



A. C. Callen

perimeter of about 31 feet. About 3 pounds of dust per lineal foot, or about 3 pounds of dust for each 31 square feet of surface of our entries is used. Costs of rock dusting small-output mines could be compared with large-output mines and in some of the thin and thick seams. The mines with long haulage roads and air courses producing small tonnages of coal could be compared with new mines having short haulage roads and large tonnages.

"John T. Ryan, of Pittsburgh, states rock-dusting costs vary from eight-tenths of a cent per lineal foot of entry to 2½ cents per lineal foot, and that the average is about 2 cents per foot. These figures are based on equipment with the cost of a machine from a minimum of \$950 to a maximum of \$2,000. Fixed charges, cost of material, labor, power, etc., are included. The initial application has varied from 2.7 to 3.5 pounds per lineal foot.

"Dusting by hand costs range from 3 to 8 cents per lineal foot, 5 cents being a fair average.

"The following is an exact analysis of the cost of dusting a large mine in the coke region, where the height of the coal is 8 feet:

Main haulage road.....	56,000 ft.	
Butts with motor haulage.....	12,600 ft.	
Total		68,600 ft.

"Initial cost of rock dusting 68,600 feet, applying 3 pounds of dust per lineal foot, was \$1,375. The cost of two subsequent dustings of 2 pounds per lineal foot each was \$1,850, or a total of \$3,225; about 4.7 cents per yard. The cost of the first dusting was about 2 cents per lineal foot.

"The following is cost data from a mine in central Pennsylvania where the coal is about 4 feet thick and the average cross section of the entry is 60 square feet:

No. lineal ft. of entry dusted.....	41,425	
Lbs. stone used.....	175,140	
Or 4.23 lbs. per lineal foot.		
Cost of applying rock dust....	\$322.21	
Cost of rock dust.....	\$709.84	
Total cost.....		\$1,032.05
Cost per lineal foot, 2.4 cents.		

"The Pittsburgh Coal Company, dur-



No. 8 Mine, Phelps-Dodge Corporation, Dawson, N. Mex. Above, main entry, "adobe" dusted on the floor, ribs and roof dry dusted. Battery of V-trough dust barriers in the background. Below, sampling floor dust

ing the last five months of 1924 and the first three months of 1925, dusted 81 miles of roadways, or, to be exact, 464,788 lineal feet. The cost of the rock dust was \$4,839.61, the labor cost of applying it was \$3,940.72, or a total of \$8,780.33, or 1.9 cents per lineal foot of roadway. This company paid the wages fixed by the Jacksonville scale, and the cost of the dust and the wages of applying it are the only items considered. The average number of pounds of dust used was 3.08 pounds per lineal foot.

"These figures are from a group of mines and represent first, second and some third dustings.

"At one of these mines 123,348 feet of entry were dusted and used 357,200 pounds of dust, or 2.9 pounds per foot. Allowing for depreciation of machine, oil and power used, the total cost was \$2,177.51, or 17.6 mills per lineal foot.

"At another mine in the same group 33,790 feet of entry were dusted and used 106,000 pounds of dust, or 3.13 pounds per foot of entry, at a total cost of \$524.19, or 15.5 mills per lineal foot. These mines used the same type of distributing machine, but have a difference in height of the seams of about 14 inches,

the thicker seam having the lowest cost per foot.

"Another company applied 240,500 pounds of dust on 82,650 feet of entry at a cost of 22 mills per foot, all charges included.

"Another company applied 216,460 pounds of dust on 126,101 feet of entry at a cost of 15.6 mills per lineal foot of entry. The second dusting at this mine is said to be partly finished and used 30,000 pounds of dust on 15,000 lineal feet of entry at a cost of 17 mills per foot.

"In order that we may know definitely the ash content of our dusts we divide the mine into zones of 5,000 feet of roadway. At every 500 feet we establish a station, which is marked by a wooden label with its proper zone and station number.

"Before the mine is dusted a sample of dust is taken at each station. Samples are again taken after dusting to make sure that the proper amount of stone dust has been applied. About every 30 days other samples are taken at each station, and when the combustible content drops below 65

percent the area is dusted again. The incombustibility of the dusts varies for different reasons, such as coal falling off cars due to bumping or jerking at some places along the road, the structure of the sides and roof of the haulage road, etc. Some of our men think the reduction of ash content averages about 3 percent per month, but I think, taking the region as a whole, it is much greater.

"Samples are always taken at the same place near the zone station mark, and then carefully conveyed to the laboratory and volumetric determinations made for incombustibility.

"We use the same methods of collecting samples and making determinations as those recommended by the Bureau of Mines.

"We do not use many barriers. Those that are used are placed to isolate worked-out portions of the mines.

"Some experiments have been made with barriers, and we are not convinced they will act in time to permit the dust to mix with the air before the flame reaches the barrier. We have been in-

formed that some explosion waves travel as fast as 4,000 feet per second.

"Explosions have been known which did not have sufficient force to cause the barrier to act until after the flame had passed. Barriers erected near the faces of entries to stop an explosion from passing into the room sections may act from a concussion caused by a heavy blast. They have a useful purpose, however, if a blown-out shot takes place and the dust is ignited and propagation extends toward the room workings. Propagation will in all probability be stopped if the barrier acts and the area of the explosion limited.

"Some trough-type barriers have been used. They are made V-shaped from 10-inch boards about 9 feet long and are set crosswise in the entry. They are supported by rails fitted with notches about 2 inches deep to receive the troughs. Each trough contains about 150 pounds of dust.

"Another type of barrier I have heard about is known as the gate barrier and consists of a hinged door placed horizontally with sufficient space between it and the roof to contain about 650 pounds of stone dust. Two props are lightly set at the loose corners in such a way that the door will easily become loose and one end fall, dropping the dust into the air of the entry.

"Another barrier of ingenious construction I saw a few weeks ago was made of square-shaped troughs supported by small iron axles in an unbalanced position, so that a force acting upon a catch released the trough, which, being unbalanced, tipped over and spilled the dust into the air. These troughs had wooden strips placed along them for the purpose of retarding the flow of dust and distributing the flow over several seconds time.

"There are several other forms of barriers in use which nearly everyone is familiar with.

"Some important points regarding barriers are as follows:

"They should be sensitive to operate with the pioneer wave of an explosion but not sensitive enough to act with ordinary blasting waves.

"On account of their liability to act accidentally, trough barriers of the independent type should contain about double the amount needed to stop an explosion.

"The flow of dust from barriers when they operate should be distributed over a period of several seconds, say not less than 5 seconds. They should be so con-

structed that air and moisture will not pass over them.

"As the greatest danger from coal-dust explosions is at the working face, and the greatest amount of dangerous coal dust is made there, we should try to work out a scheme to eliminate that danger. Several companies located in various parts of the country have experimented with appliances to wet machine cuttings as they are produced. One suc-

removed from cars at tipple. Cars must be kept as tight as possible.

"At a mine where we formerly washed down the roofs, ribs and gobs with water to free them from coal-dust accumulations, we made an important discovery after we began to test the combustibility of dusts incident to rock dusting. Samples of dusts taken on the exposed surfaces of gobs contained a fairly high ash content. After washing down the gobs with water and then undercutting the room ribs, and taking dust samples, we found the combustibility of the dusts to be considerably increased over that of the old dusts. In other words, we were replacing a high ash dust with a low ash dust. I suppose a great many mines did the same thing while they were using water.

"We do not believe rock dusting is a cure for all mine explosions.

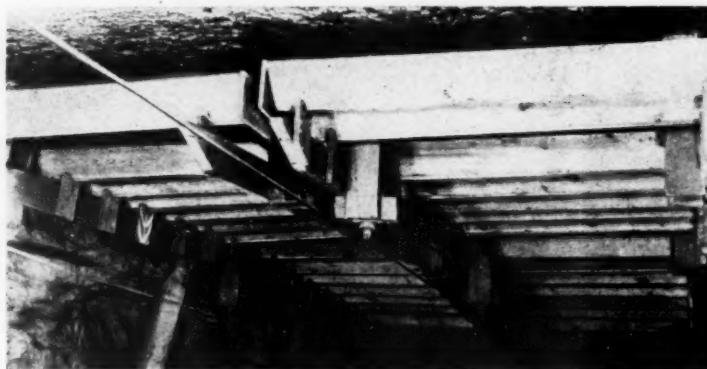
We maintain the same

rigid discipline we formerly did in regard to blasting and ventilating. We thoroughly ventilate every part of our mines that is possible to do so. We circulate the amount of air around the faces and gobs required by the Pennsylvania mining laws. Permissible explosives are used for blasting in dry, dusty and gaseous mines. Electric cap lamps are used in all our mines which generate fire damp. Shotfirers are employed where electric cap lamps are used. Shotfirers put off all blasts by electricity. Fire bosses make two and three rounds every shift. Assistant mine foreman visits all working places two or three times every shift. Electrical machinery is not operated in gaseous portions of mines unless it is flame-proof. We do not work in gas except to do the work necessary to remove it. Every gaseous mine is treated as though it were dangerous regardless of how much rock dust has been applied.

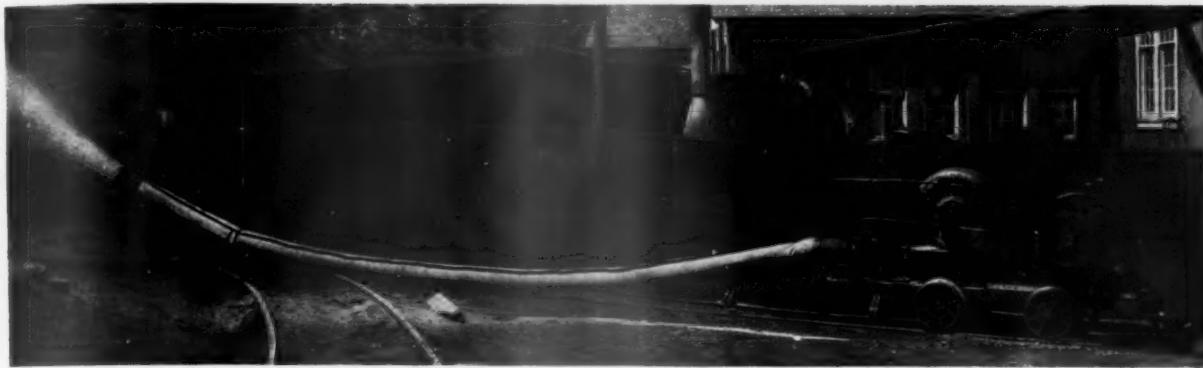
"The overall dimensions of the rock dust machine should conform to the minimum width and height of haulways and distance from rib to track.

"The hopper should be of such height that it will hold as much dust as possible and have ample clearance over the top of it to permit dust to be shovelled or poured into it without having to be taken to some special place where the roof is high.

"In some of our mines the dust crew load the hopper as the machine moves along, by carrying dust and dumping it into the hopper. The dust is put up in paper bags of about 80 pounds each and



V-trough dust barriers, Phelps-Dodge Corporation, Dawson, N. Mex.



Home-made dusting machine, Phelps-Dodge Corporation, Dawson, N. Mex. This machine uses a Buffalo blower and has a disk feeder at the bottom of the hopper. An 8-inch canvas hose is used for dusting air courses

is taken along in the dust train in the next car to the machine.

"The wheel base of the machine should be of the proper length to permit the machine to pass around any curve or switch in the mine.

"The machine should be so constructed that the operating parts will be out of the dust cloud that follows the machine. Dusting, of course, should always be done toward the intake air current.

"Our dusting is always done during the night or on Sundays and the dusting crew are always sure to see that no person is working on the return air side of them while dusting unless they are a considerable distance away.

BARRIERS

"The following is the cost of a 'V' trough barrier erected at one of our mines. It is made of board 10 inches wide and 8 feet 3 inches long.

"Seven troughs comprise one barrier.

Lumber

7 troughs, 147 ft. at \$44 per M.	\$5.59
14 bearers, 19½ ft. at \$44 per M.	.86
12 posts at 20c.....	2.40
40 ft. stringing at \$44.	1.76
Nails .....	.10
 Total	 \$10.71

Stone Dust

7 troughs, 149 lbs. each—1,043 lbs.	
1,043 lbs. at \$6.55 per ton	\$ 3.41

Labor—Erecting Barrier

2 men, 8 hrs. ea. at \$7.25 per day.	\$14.50
Hauling material and filling	
troughs; 2 men, 2/8 day ea., at \$7.25 per 8 hrs.....	3.63

Total cost of labor.....	18.13
Total cost of material.....	14.12

Total cost of barrier.....	\$32.25
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In the discussion following the presentation of this paper, Roy Reddie, of Knoxville, Tenn., stated that:

"While it is a fact that you can mix sufficient rock dust with coal dust to bring the explosive danger down to the vanishing point, it nevertheless is a statement of fact that a study of the velocity of rock dusting would indicate that a carbonate should be used. A great many coal men think they can use an easily dissociated carbonate. Any kind will do if you can grind it cheap enough and get enough of it in there, but if you can get a carbonate of lime at anything like the cost of shale, that is the thing to use. Just as soon as you get over 120 or 130 mesh in grinding rock you begin the consumption of steel. When you get up around 200 mesh the consumption of power and steel is tremendous. I very much doubt if it will pay to put in small plants to grind rock down to 250 mesh. I believe it will be cheaper for a number of mines to put in an individual grinding plant."

ROCK DUSTING IN WESTERN MINES

Daniel Harrington, for many years with the United States Bureau of Mines, now consulting engineer with headquarters at Salt Lake City, in telling of rock dust problems in the western states, said:

"The rock dusting that I am fairly familiar with is entirely in Colorado, Utah, New Mexico and to a slight extent in Wyoming. After the Castle Gate explosion in Utah in 1924, the Utah Industrial Commission required all mines of Utah to be rock dusted. The wording of the regulation, which has the effect of a law, was that all intake air courses should be rock dusted as far into the mine as freezing extended in the coldest weather. Utah has had for about 25 years a law which requires the sprinkling of interiors of the mines. At the present time every mine in Utah is required to carry a water line up to every face. The practice of the Utah mines in general is to rock dust the working faces. The back entries or return air courses are very

humid. The air is saturated on account of the large amount of water which is down at the faces, and the limestone soon becomes saturated with moisture and turns into a mud. However, we do not feel that that is very much of an objection. There is so much water used now that the dust that is applied on the ribs close to the interior entry faces becomes a mud and the coal dust that settles on that wet rock dust soon becomes thoroughly wet also and, notwithstanding the fact that the general supposition is that sprinkling has failed throughout the country, the western states are not inclined to feel that way about it.

"In Utah, they put water on the cutter bars, and any machine runner who is caught cutting without water on the cutter bar is liable to a fine if brought into court, and certainly a suspension from the mine operators. While all of the Utah coal operators agreed to the new regulations before they were issued some have been somewhat doubtful as to the efficiency of rock dusting. Some of those at first frankly skeptical now are rock dusting far beyond the amount specified in the new regulations; others are rock dusting as specified by the new regulations or even beyond the demand of the regulations and are simultaneously sprinkling the floor of the places where ribs, roof and floor are rock dusted and are soaking the interior mine workings.

"One of the most extensively adopted adjuncts to rock dusting in western mines is the spreading on the floor of intake haulage entries of surface soil or adobe which usually becomes dry and dusty and in addition to greatly aiding in track ballasting also sends into the air by movement of animals and trips considerable quantities of finely divided incombustible dust which ultimately settles on the ribs, timbers and roof, and aids in keeping percentage of combustibility low. During the past year and a half much over a hundred miles of haul-

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age entry floor in Western coal mines have been covered with from a few inches to as much as a foot of soil or adobe at a cost of from as low as 10 cents per foot of entry to as high as 25 cents, or even more, depending upon thickness of the covering, amount of preparatory cleaning done and whether the adobe can be found readily available to the mine, whether it can be loaded in pit cars by steam shovel or by horse scraper and trap, or by hand. Suitable material for the floor covering is almost anything which pulverizes upon becoming dry, and has combustible percentage of less than 10 percent. In many instances the material has over 50 percent free silica, but no alarm is felt since very little of this material gets into air breathed by workers and up to date no complaints have been made nor has there been any evidence of trouble. While placed in mines in lumps as large as a man's head this material dries and disintegrates to such an extent that when sampled on entry floors after a few months of service it runs 25 to 50 percent through 200 mesh.

"For ordinary rock dusting purposes the material most in use in the West is crushed limestone obtained from cement mills or smelters at a cost of \$3.00 to \$5.00 per ton sacked at the mills or smelters, fineness being 40 to 60 percent through 200 mesh. Freight brings cost f.o.b. mine to \$5.00 or \$5.50 and in at least one instance to \$8.00 per ton. A few mines in Utah have brushed with 'leucite.' This is silvery white in color and glistens brilliantly when crushed to 100 mesh or less, is practically entirely incombustible, costs about the same as the crushed limestone and is placed on the ribs and roof almost as readily as limestone. Both the crushed limestone and the crushed leucite absorb moisture in humid air. A few mines are preparing to crush their own local material and at least one company in Colorado has a combined crusher and rock duster which converts mine shale underground to dust and immediately deposits it. This company rock dusts all open parts of the mine up to and including the faces. A few mines are converting local shale soil to a watery mud of about 20 percent solids and 'muditing' or covering roof, ribs, and floor with the watery mud which has some decided advantages as to protection and covering of exposed surfaces; and with certain kinds of soil and upon use of successive coatings in places which dry out rapidly, the dried 'mudite' acts largely as ordinary rock dusting.

"Some smaller mines apply rock dust by hand, but most of the companies have made their own rock dusters and curiously enough most of the rock dusting machines are essentially modelled after the one used by the Victor-American

Fuel Company at Delagua, Colo., in 1912 to 1916, consisting of a small electrically driven belt connected blower (W.G. 2 to 5 inches) and a dust hopper with outgoing pipe. Locally made machines of this type cost somewhat less than \$1,000.00 and some of them dust 25 to 35 lineal feet of entry per minute. One such machine recently redusted 17,000 feet of entry averaging 10 x 12 feet in cross section in eight shifts. Cost of rock dusting by these blower units using crushed limestone or crushed



Daniel Harrington

leucite runs 2 to 4 cents per foot of entry; about 60 percent being labor, 30 percent rock dust and about 10 percent miscellaneous items, such as power and materials used. The amount of dust deposited on ribs and roof runs 2 pounds or less per foot of entry. Many of the Utah mines have used compressed air on an injector principle, forcing rock dust against ribs or roof with a high velocity propelled by compressed air at 40 to 70 pounds per square inch. This so-called high pressure dusting dislodges coal dust from crevices, ledges and other projections and leaves a plaster of 1/8 to 1/2 inch of rock dust upon ribs, roof and timbers. The mining companies of Utah practically all have air compressors, stationary or portable, and water lines (now universal in Utah mines) can be used for carrying compressed air. As a result the high pressure dusting is popular, as it leaves a heavier coating of dust than other methods (3 to 6 pounds per foot of entry), and costs but little more than with the low pressure methods, costs running 4 to 6 cents per lineal foot of entry. Many Utah operators now believe the first coating of rock dust should be made by the high pressure method with subsequent or redusting coats, which require but 1 to 2 pounds per foot of entry, to be done with low pressure machines which are somewhat quicker. One Utah mine now figures on placing rock dust boxes along mine workings about every 500 feet and using the compressed air through water lines to force the rock dust into the air to be later deposited by the air on roof, ribs and floor.

It is expected to be able to rock dust practically all intake air courses of a fairly large mine (capacity 2,000 tons per

day) in about two shifts. Another mine now has a very effective dusting machine of the usual blower type but taking its power from the wheels of a pit car which may be hauled by a mule. It is not felt by many Utah coal mining men that where air velocity is around or in excess of 500 feet per minute, redusting can be readily done by using the air currents as distributor when the dust is thrown into the air by blower at points about 500 to 1,000 feet apart; however, other operators say that using air currents to distribute rock dust bears the same relationship to efficient rock dusting as do frozen water lines to efficient sprinkling methods.

"There are two methods of application, either high pressure dusting or low pressure dusting. Low pressure dusting out of an ordinary blower, water gauge 2 to 5 inches and utilizing the air currents to carry the dust. High pressure dusting is the use of compressed air or cement gun with possibly 60 to 80 pounds to the square inch. The air pulls the dust out of a little trough or bin and forces it against the rib or roof at considerable pressure. High pressure dusting has the effect of plastering the dust to a thickness at $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ inch. You get a much larger quantity of dust on your ribs and roof with the high pressure dusting. You can, of course, get considerable amount of dust with the low pressure dusting if you can put the nozzle of your pipe that conveys the dust from the low pressure blower, from 6 inches to a foot from the rib in order to get a thickness of the dust on it. In the workings that are dusted with the high pressure machine you cannot see coal. No human being can tell whether he is in a rock tunnel or whether it has been covered with rock dust. With low pressure methods that is not so easily done.

"Costs are about as Mr. Neale gave them to you except where they use the high pressure method. Four, five, or six cents per lineal foot per entry. In Utah we have very thick seams of coal and many of our entries will be 12 to 14 feet wide and 8 to 10 feet high. There is an enormous area to be covered by dust. The costs run for low pressure dusting as low as 1, 1 1/2, and 2 cents per lineal foot and in some instances the low pressure dusting runs up as high as 3 1/2 to 4 cents per lineal foot of entry. There are as yet very few rooms in Utah that have been dusted. The analysis of the cost figures seems to run about 60 percent labor, 30 percent cost of rock dust and 10 percent incidental costs.

"My experience in connection with the effect of dusts on health is that as far as rock dusting is concerned in coal mines there would be little, if anything, to fear no matter what the silica con-



*"Muditing" the ribs and roof of an entry with a "cement gun,"
Phelps-Dodge Corporation, Dawson, N. Mex.*



Trip spray on main parting, No. 6 mine, Phelps-Dodge Corporation, Dawson, N. Mex.

tent of the dust may be. As a matter of fact the adobe which we are using in the West at the present time contains 20 to 60 percent silica. The trouble from silica dust comes from having enormous quantities in the air at all times breathed by the workers, and the only particles that are doing any harm are the extremely fine particles which remain in stagnant air. So far as I am concerned, I would not hesitate to use sandstone. The present practice in Utah is to use limestone for the ribs and roof and the adobe for the floor.

The Utah regulation requires the use of barriers which are of the V trough. In general, however, instead of using 6 or 7 troughs, the western practice is to use 16 troughs as a minimum. The quantity of dust per barrier runs from about three to six thousand pounds per barrier.

The cost of installation of barriers of the V trough type constructed of wood runs, in Utah, New Mexico, and Colorado, from fifty to sixty-five dollars per barrier. If there is much roof to be taken down it may run as high as \$100.00. In one mine in Utah barriers are of galvanized iron. The galvanized V trough, will in the long run be much cheaper, although the first installation is about double the cost of wooden ones. The material for barriers has been varied. Some mines use a succession of comparatively loose shelves as barriers, the shelves extending practically across the opening where there is haulage or along the rib where there is haulage; some properties use as barriers a supply of rock dust held in a perpendicular box-like opening in the rib, held in place by a door which is opened by a vane-like trigger extending into the mine opening. A few mines are preparing to use the concentrated type of barrier recommended by the Bureau of Mines. Some mines have well over a hundred barriers installed, though in general not more than 15 to 25 barriers are found in any one mine

and most mines have omitted the barriers wholly.

"For dusting, we have tried the adobe, flue dust from the boilers, and straight silica dust. The most successful dust for barriers with regard to the resistance of moisture is the straight silica dust. For barrier purposes at least, I think that a silica dust is much superior to the limestone.

"The one thing that should be impressed upon every mining man is that when you rock dust you haven't covered everything. Rock dusting is one of a considerable number of things that should be done—proper ventilation, lighting, dust at the face should be taken care of—all of the ordinary preventive methods should be taken whether you rock dust or whether you don't rock dust."

In the discussion which followed Mr. Harrington's remarks, Mr. Neale stated that:

"I would advise anybody that intends rock dusting to begin at the face and dust toward the shaft bottom. We always begin at the face and dust toward the entrance of the mine."

Eugene McAuliffe, of the Union Pacific Coal Company, stated that he believed that "we are talking more than we are doing about rock dust." He also stated that his company was given credit for having done more rock dusting than it actually had done, and that although they have spent a great deal of money, the results are not satisfactory. Continuing, Mr. McAuliffe said:

"The question of material is proving to be a serious one. We gathered up some of the adobe dust that Mr. Harrington speaks of and we put that in the mines. It turned into muck very quickly and we questioned the permanency of that material. Then we sent our Safety Engineer over into Illinois to study the Old Ben's method. He came back and recommended the purchase of a crusher, specifying the size of a plant that we would require. I went over myself to inspect the mill,

doubled the capacity of the machine that was recommended and we have been over six months now trying to make a success of that plant.

"The job of pulverizing to 200 mesh is a big one. I am coming to the conclusion that a pocket-size mill is not an economical proposition. We bought one that was guaranteed to grind three thousand pounds an hour. As I say, we have been continuously rebuilding, changing and shifting the apparatus for six months, and I am not sure that we won't have to take it out and get something else. In the meantime we have bought shale dust containing a heavy lime content. That, including a rather nominal freight rate, plus the sacking, cost in the neighborhood of \$9.00 per ton laid down at Rock Springs. Thereafter the expense of unloading it and carrying it into the mines must be added to the \$9.00, bringing the cost up materially.

"Too many of us are starting rock dusting like the girls are starting their beautifying—in front, neglecting the part back of their ears. Nearly everybody seems to be imbued with the importance of making a show and start at the mouth of the main slope and dust in one-quarter or one-half mile and then stop, very frequently never getting to where explosions start. I think that Mr. Neale's statement that the work should start at the face should be emphasized, because that is where the explosions start. A great many of us are looking on rock dusting and perhaps sprinkling as something that will insure the safety of our mines. There is something above and beyond rock dusting, and that is, to my mind, ventilation. We are following up our studies and investigations scientifically and we are getting a lot of information, and it appears that ventilation is not always maintained where the gas is generated. Perhaps if these problems of ventilation and water supply are solved, our rock dusting and sprinkling problems will be very much reduced."

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ROCK DUSTING AT PHELPS DODGE CORPORATION'S DAWSON, NEW MEXICO, PROPERTIES

James W. Needham of the St. Paul Coal Company, read a paper prepared by W. C. Holman, chief engineer, Phelps Dodge Corporation, presenting their experience with rock dusting, as follows:

"Our generally accepted practice, is the application of incombustible dust on all motor roads, back entries, and return air courses; in some mines dusting is considered necessary in the room necks.

"Caved areas are usually sealed when completed, but in some instances, the open gobs are dusted.

"The materials used are, limestone, gypsum, shale, mill tailings and silicious clay known as adobe. An average screen analysis for the dust would be 50 percent through 200 mesh, 15 percent through 100 mesh, and 35 percent through 20. Tests as high as 70 percent through 200 mesh are obtained with limestone dust.

"Due to the inefficiency of small grinding plants in preparing dust of the required fineness, most of the material is purchased direct from cement plants, sacked, ready for application in the mines.

"The dust is applied by low pressure blowing machines, such as the M. S. A. Distributor, the home-made machines, using Buffalo and Sturtevant blowers, and by a 'Cement Gun,' operating under high pressures. A crew of two men, in an eight-hour shift will distribute four tons of dust, which will satisfactorily cover the ribs and roof of a 6 ft by 9 ft. entry, for a distance of 2,000 feet.

"Our experience shows that a machine such as the Cement Gun with a uniform feeding device, operated at about 15 lbs. pressure, is best adapted for applying dust directly to the floor, ribs, and roof of an entry not more than 70 sq. ft. in area. For blowing in back entries the pressure is increased to about 35 lbs. per square inch.

"Two applications of dust per year is generally considered sufficient, but this is determined by the analysis of samples.

"The cost of rock dusting depends in a large measure upon the availability of the material used. The following costs are based on data compiled at the mines where rock dusting is practiced in the northern section of the state.

"At the Dawson mines, the cost of dusting 5,000 feet of 6 ft. by 10 ft. entry using a type N-O Cement Gun with a crew of two men is as follows:

bustible to determine the exact areas to be renewed.

"The velocity of the ventilating current is reduced when collecting samples

	Cost per 1,000 lin. ft.
Limestone dust, 9½ tons at \$10.65.....	\$101.18
Labor, 32 hours at \$0.75 per hour.....	24.00
Supplies (power, oil, water).....	7.40
 Total cost	 \$132.58
	\$26.51

MISCELLANEOUS DATA	
Total cost per lin. ft of entry.....	\$0.0265
Dust applied per lin. ft. of entry.....	3.8 lbs.
Pulverized limestone f.o.b. El Paso, Texas.....	\$5.00 per ton
24 sacks at \$0.10 f.o.b. El Paso, Texas.....	2.40 per ton
Freight to Dawson	3.25 per ton
 Total cost f.o.b. Dawson.....	 \$10.65

"Spreading dry clay or adobe dust to a depth of about three inches on the floor of the main motor roads where there is considerable combustible material, is practiced in some mines. In order to avoid contamination of the dust by coal falling from passing trips, the loaders are not permitted to top the cars. Grinding or pulverizing of the adobe is not considered necessary. One application is sufficient for at least a year. The motor roads being the intake air-courses, the dust is readily carried into suspension by passing trips, men, and mules, and by dragging a pine tree top at the rear of trips in and out of the mines. In this manner the dust is carried several hundred feet into the mines and facilitates the dusting of the ribs and roof.

SAMPLING

"Thorough sampling of all dusted areas is necessary to safety.

"Samples are taken every sixty days.

"The mines are divided into 1,000 ft. sections, and each consecutive sample is taken at intervals of 200 feet in by each 1,000 ft. mark. In this manner the entire dusted area is sampled every ten months.

"Special samples are also taken at cross entry switches and on the main partings.

"Repeat samples are collected at 100 ft. intervals each side of any section showing less than 80 percent incom-

from the ribs, roof and timbers. These samples are taken when the mines are idle.

"The standard method of sampling suggested by the Bureau of Mines is used.

"To further test for combustible, a one cubic foot brushed sample is taken from the ribs, roof and timbers. This material under pressure is then discharged through a barrel cannon into an electric arc to determine the explosibility. Pure coal dust is burned before and after the regular mine samples as a comparative test.

"The U. S. Bureau of Mines has recently conducted a series of tests on Dawson coal which are of interest.

"1. An explosion was propagated through a mixture of 50 percent coal dust and 50 percent shale dust, the moisture and ash content of which would be approximately 55 percent. There was no gas in the air in this test.

"2. An explosion was propagated through a mixture of 40 percent coal dust and 60 percent shale dust, with 1 percent of gas in the air current. The moisture and ash content of this mixture would be about 64 percent.

"3. An explosion did not propagate through a mixture of 30 percent coal dust and 70 percent shale dust, with 1 percent of gas in the air current. The moisture and ash content of this mixture would be about 73 percent.

"The cost of collecting and analyzing dust samples, based on a rate of \$0.75 per hour, is about \$0.45 per sample.

"MUDITING"

"The practice of applying either wet adobe or mill-tailings to the ribs, roof and timbers of the main motor roads has been found practical.

"The mud is applied by a Cement Gun under pressure, 35 pounds being sufficient to dislodge all coal dust and to

COSTS

Pulverizing rock at the mines.....	\$3.60 to \$3.00 per ton
Prepared dust, sacked, f.o.b. mines.....	8.90 to 10.65 per ton
Size of entries.....	6 ft. by 10 ft.
Pounds of dust per lin. ft. of entry.....	3 to 8
Labor charges per lin. ft. of entry.....	\$0.010 to \$0.015
Material charges per lin. ft. of entry.....	\$0.015 to 0.035
Prevailing wage scale per hour.....	0.75

thoroughly fill all cracks and crevices and cover the ribs and roof with a coat of incombustible material averaging $\frac{1}{4}$ inch in thickness.

The common objection to the wet method is that certain materials dry to a hard surface, and in the event of an explosion very little dust is thrown into suspension; but when adobe or mill-tailings are used, the coating formed, when dry, is powdery and fluffy.

The advantages claimed for the wet method are:

1. More dust is applied per lin. ft. of entry.
2. Cracks and crevices are entirely sealed.
3. Timbers are completely coated.
4. Protruding ledges are rounded off, reducing the opportunity for coal dust to collect.
5. Mudding forms an effective base for the application of dry dust.
6. Health of the workers.

Where conditions permit the application of water on the ribs and roof, it is feasible to wash all coal dust off and apply dry dust. To further insure protection the coal from the floor is loaded out before dusting.

COSTS

Adobe dust applied wet per lin. ft. of entry	34 pounds
Material cost per lin. ft. of entry, \$0.018	
Labor cost per lin. ft. of entry.. \$0.042	
Number of feet per entry per 8-hour shift	420
Number of men in a crew..... 3	
Thickness of coating..... $\frac{1}{4}$ inch	
Prevailing wage scale per hour.. \$0.75	
Adobe weight per cubic foot.... 75 lbs.	

HUMIDIFICATION

Water is used at and near all the working faces of the Phelps Dodge Corporation and St. Louis Rocky Mountain and Pacific Mines. Miners and loaders are required to sprinkle their respective places. Water is used on the cutter bar of all mining machines. On a basis of a 6 ft. cut, 5 to 6 gallons of water per lin. ft. of cut is sufficient to thoroughly saturate the cuttings. The advantage of this practice is shown in a Bureau of Mines test where it was found that a mixture of 92 percent coal and 8 percent water was not ignited by a blown-out shot of 4 pounds of black powder; however, the flame of the blown-out shot was extended 50 feet by the wet dust. Dust containing this amount of water is just damp enough to mould in the hand. There was no gas present in this test.

The pit cars pass under trip sprays in every panel entry and again on the main partings, each time being drenched with approximately 2 gallons of water.

Special sprinklers are employed to wet down the entries, not dusted. On an eight-hour shift at a labor cost of \$6.08, 3,000 ft. of entry are thoroughly sprayed.

Water used for sprinkling is pumped from the mine workings to storage tanks on surface.

A pressure of from 50 to 100 pounds is maintained on all sprinkling lines.

Automatic sprays are placed at intervals of 500 feet in all panel intake entries not dusted.

DUST BARRIERS

V-trough dust barriers made of 1 x 8 material are installed at the intersection of the main, cross, and panel entries. They are filled with limestone or mill-tailings, 27 pounds per lineal foot.

A battery consists of 16 troughs, each about 10 ft. long. They are either supported on 2 x 6 stringers on the props or suspended from the roof. The cost of constructing and filling one complete battery is \$60.00, present wage scale \$0.75 per hour. The dust from the barriers is sampled and tested for moisture and combustible.

The material used in V barriers is 95 percent incombustible, and 50 to 60 percent will pass a 200-mesh screen.

Rock dusting in conjunction with efficient humidification is considered the most practical method of minimizing and localizing possible explosions. However, the effectiveness of the method depends almost entirely upon the thoroughness with which the work is done and subsequent attention given to sampling and renewals."

CONSERVATION BRANCH CREATED

WITH the transfer of the public land mineral leasing activities of the government from the Bureau of Mines to the Geological Survey, a new organization unit to be known as the "Conservation Branch" was created in the Interior Department

This branch under the supervision of the Director of the Geological Survey will have engineering control of all mineral leasing on the public domain as well as the classification of public lands, which has long been an important function of this bureau. Creation of this greatly enlarged branch and placing added duties under the Geological Survey is in accordance with the policy of Secretary Work of the Interior Department in stressing conservation by employing the nation's natural resources along sound economic lines.

In a recent statement Director George Otis Smith of the Geological Survey said:

"Secretary Work's transfer of the mineral leasing supervision to the Geo-

logical Survey permits a new line-up of the Department of the Interior's activities in promoting development of the public domain. The protection of the public estate, the guidance of the development of its resources, the promotion of wise use of the products of the national domain are practical objects, all summed up in the one word, conservation. So it is that to the land classification activities of the Geological Survey are now added the supervision of the leasing of the oil, coal, and other minerals on the public and Indian lands. The two types of work are closely related and have had some informal connection in the past, but now they may be directly coordinated so that the oil geologist and the oil engineer, for example, will work in close contact on their common problem of wise administration of the resources in public ownership.

The fundamental principle of all these public land activities is conservation as understood in its broadest sense, and the new name of the branch sums up the purpose of the Geological Survey throughout the long record of its explorations and investigations in the public land states.

Equally apt is the term conservation as descriptive of the technical service rendered by the engineers hitherto working under the Bureau of Mines in the field supervision of all operations under prospecting permits and leases in the oil and coal fields of the West. These engineers safeguard the government's interests, and by their practical advice based upon technical training and wise experience materially aid the lessees in the economical development of the resources. Here again best use is the keynote.

The Secretary of the Interior is defining the conservation policy in his Department along practical lines. Just as the President's Oil Conservation Board is now engaged in the appraisal of the possibilities of this resource so essential to industry, the same principle is being applied through the organization of this branch in the Geological Survey. To Secretary Work and his associates in the Cabinet and within his own department conservation means use without waste of our natural resources and their intelligent distribution as to time. He believes that reckless waste of the people's inheritance from nature cannot be allowed to deplete the capital of future generations."

The substitution of all-steel cars was one of the principal factors in reducing by approximately \$80,000,000 the cost of maintenance of freight cars in 1924, according to R. H. Aishton, president of the American Railway Association.

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GRAPHIC CHARTS IN INTERPRETATION OF COSTS

Cost Reductions Too Frequently Are Made Without Proper Regard For Resultant Conditions And Adequate Knowledge Of Elements Constituting Total Operating Costs—How Graphic Charts Assist In Arriving At Proper Basis

SELDOM, if ever, has any industry been in a state which required as intelligent cost reduction as the coal industry demands at the present time. The word "intelligent" requires special emphasis, because cost reductions in this industry are too frequently made without proper regard for the resultant condition of the property and are often made without adequate knowledge of which of the elements constituting the total cost are at fault. In this discussion it is my intention to confine myself almost entirely to that portion of the cost of production covered by payroll labor.

It might be well to state that inasmuch as I am not an accountant, but am in active charge of the operating details of 23 bituminous coal mines, located in six Pennsylvania counties, this subject will be treated from an operating rather than an accounting standpoint.

Too many operating officials fail to look beyond their *total labor cost*. If a mine produces the same tonnage in two cost periods, and in the latter of the two periods does so at a decline of, say, 5 cents per ton, the satisfaction occasioned by this reduction too frequently prevents that minute degree of analysis of cost which a corresponding increase may have occasioned. Such reductions in total labor cost may have included gratifying reductions in some of the constituent items of the cost and entirely unwarranted increases in other items which, on account of the resultant cost having been lowered, were entirely lost sight of.

Inasmuch as each of our mines submits a semimonthly distribution of payroll, along lines suggested several years ago by the National Coal Association, on sheets made up as shown in Figure 1, data are readily available to tabulate semimonthly labor costs under the captions of "Mining," "Yardage and Deadwork," "Timbering," "Drainage," "Ventilation," "Haulage and Hoisting," "Tipple," "Preparation," "Railroad Car Loading and Yard Expense," "Structural Maintenance and Repairs," "Equipment Maintenance and Repairs," "Sundry Labor," "Superintendence," "Mine Office," and "Power Plant."

The figures constituting these 15 subdivisions, as well as the tonnage and total cost figures for 23 mines, were so numerous and confusing that it was found impossible to appreciate their

By W. L. AFFELDER*

value properly in a semi-monthly period alone, to say nothing of being able to benefit by comparing them with previous costs, under similar conditions as to tonnages and wage rates. It was, therefore,

decided at the beginning of the year 1924 to plot all semi-monthly labor costs on graphic charts especially designed to serve for a period of three years. A blank chart is shown in Figure 2. These charts are $12\frac{3}{4}$ by 22 inches, with the horizontal and vertical spacing $\frac{1}{8}$ and

Form 1000 Run		PLANT. DISTRIBUTION	
1	COAL LABOR	1	COAL LABOR
2	MINING	2	Brought Forward
3	(Tons or Wagons)	3	TIMEKEEPING
4	PICK COAL	4	Tinder Man
5	"	5	Cross Bars
6	"	6	Posting up & Drawing Posts
7	"	7	Handling Material Inc.
8	"	8	
9	Total Account 41	9	
10	MACHINER COAL	10	Total Account 61
11	Loading	11	DRAINAGE
12	"	12	Pumpers & Balers
13	"	13	Drain Cutting & Cleaning
14	Cutting	14	Pipe Men
15	"	15	Equipment Repairs
16	"	16	
17	Scraping	17	Total Account 62
18	"	18	VENTILATION
19	"	19	Bratticemen
20	Places out	20	Overcasts and Stoppings
21	Runs	21	Sprinkling
22	"	22	Cleaning Aircourses
23	Cutting at Day Work	23	Fan Engineers
24	Drilling holes	24	Equipment Repairs
25	" "	25	
26	" "	26	Total Account 63
27	At Day Work	27	HAULING & HOISTING
28	"	28	Parting Boys
29	"	29	Box Driver
30	Total Account 42	30	Drivers
31	Company Coal	31	Breaking in Stock
32	Shoelaces	32	Motormen
33	Moving Machines	33	Snappers
34	Bit Sharpeners	34	Bottommen Switchers
35	Machine Boys & Helpers	35	Cagers and Hookers-on
36	Bit Currier	36	Grip men
37	"	37	Haulage Engineers
38	"	38	Check Housemen
39	Total Account 43	39	Rope Rider
40	YARDAGE	40	Trappers
41	Entrance	41	Groomers
42	Loading tons	42	Sand Dayers
43	Cutting	43	Rollermen
44	Pick yds.	44	Topmen (Leadingsmen)
45	"	45	Roadmen (Truckmen)
46	Loading & Cutting "	46	Cleaning Roads
47	At Daywork	47	Pit Car Repairs
48	Breakthroughs	48	Shanty Repairs
49	Loaders & Cutters	49	Rope Haulage Repairs
50	Recontouring	50	Motor "
51	Loaders & Cutters	51	Man Trips
52	Beam Break Throughs	52	Stable Man
53	Loaders & Cutters	53	Crossing
54	"	54	Bonding
55	"	55	
56	Total Account 51	56	Total Account 64
57	DEAD WORK	57	TRIPPLE
58	Pick Cuts	58	Weighmaster
59	Clay Veins & Spans	59	Top Cager
60	Hornshocks (Holes)	60	Dumpers
61	Thick Shale	61	Pushers & Hitchers
62	Skips, Shaking	62	Pan Puller
63	Ripping Road	63	Conveyer (River Coal)
64	Lifting Bottoms	64	
65	Rockwork	65	
66	Unloading Cars (inside)	66	
67	" (outside)	67	
68	Cleaning up Pans	68	Total Account 65
69	Drillholes	69	PREPARATION
70	Allowance for Water	70	Stale Pickers
71	Manholes	71	Coal Inspector
72	Digging out Machines	72	Big Labor
73	Dirt Wagons	73	Coal Samples
74	Extra Work	74	
75	"	75	
76	"	76	
77	"	77	
78	"	78	
79	Total Account 52	79	Total Account 66
80	Forward	80	Forward

FIG. 1

Pay Roll Sheets Submitted Semi-monthly by Each Mine of the Hillman Coal and Coke Company

* Assistant to the president, Hillman Coal & Coke Co., Pittsburgh, Pa.

¼ inch, respectively. Tonnage figures are plotted 1,000 tons to the space, total labor costs 5 cents to the space, and the various subdivisions 1 cent to the space. The charts are ordinary "white prints" and are made in our blueprint room. At mines where explosives are furnished free and where an adjustment in the mining rate is made to offset the cost of explosives, "Free Explosives" cost is also shown and is included in the "Total Labor Cost." Under the "Haulage and Hoisting" subdivision, "Animal and Motor Haulage" is shown separately, as

well as being included under "Haulage and Hoisting."

As all figures used on the charts had to be prepared even for the inefficient method of cost interpretation already in use, very little additional work and no additional expense was incurred by the adoption of the charts. It goes without saying that much of the value of any comparative cost system depends upon the promptness with which the necessary data are available. Charts are, therefore, extended as soon as possible after the middle and end of each month.

OF PAY ROLL ENDING.

ITEM	AMOUNT	ITEM	AMOUNT
161 OIL LABOR		281 COKE LABOR	
162 Freight Forward		282 Yard Men	
162 H. R. CARLOADING AND		283 Chasers	
164 YARD EXPENSE		284 Leveling Machine Ovens	
165 Car Cleaning		285 " " "	
166 Car Droggers & Blockers		286 " Hand "	
167 Trimmers		287 " Dousing "	
168 Box Car Loading		288 Watering Ovens	
169 Yard Cleaning & Track Rep.		289 Drawing Machine Ovens	
170 Lorry Men		290	
171		291	
172		292	
173		293	
174		294	
175 Total Account 67		295	
176 STRUCT MAINTEN.		296 Cleaning Ovens	
177 AND REPAIRS		297 Door Men	
178 Power Buildings		298 Ashes	
179 Substations		299 Coke Bursers	
180 Tugie		300 Fortune Coke	
181 Fan Building		301 Loading Stock Coke	
182 Machine Shop		302 Carrying Coke	
183 Stable		303 Coke and Coal Crushing	
184 Other Sdy. Plant Bridges		304 Watering Coke Cans	
185		305 Firing Ovens	
186		306	
187 Total Account 68		307	
188 EQUIPMENT MAINTEN.		308 Total Account 101	
189 AND REPAIRS		309	
190 Electrician, M. Mechan.		310 Mason & Haulers	
191 Armature Winder		311 Mason Cutters	
192 Wiremen		312 Coke Machinery Repairs	
193 Blacksmiths		313 Oven & Lorry Truck Repairs	
194 Carpenter (Gen'l. Wk.)		314 Pipe Lines	
195 Machine Shop Labor		315 Carpenters Yard Work	
196		316 R. H. Truck Repairs	
197		317	
198 Total Account 69		318	
199 SUNDRY LABOR		319 Total Account 102	
200 Cleaning in		320 Car Shiflers	
201 Hunt & Handling Mat. (Outside)		321 Car Trimmers (Leaders)	
202 Fire Aid		322 Hauling & Handling Yd. Sup.	
203 Check Boy		323 Cleaning up around Coke Plant	
204 Riveters		324 Coke Samples	
205 River Pumpers		325 River Coke Loading	
206		326 Sundry Labor	
207		327	
208		328	
209 Total Account 70		329	
210 SUPERINTENDENCE		330	
211 Mine Foreman		331	
212 " " Assistant		332	
213 Night Foreman		333 Total Account 103	
214 Outside Foreman		334	
215 Fire Boxes		335 TOTAL COKE LABOR	
216 Ribb Boat		336 " COAL, "	
217 Safety Lamps		337	
218 Watchmen (Police)		338 TOTAL OPERATING LABOR	
219		339	
220		340 OTHER LABOR	
221		341 (Not chargeable to operating)	
222 Total Account 81		342	
223 MINE OFFICE		343 House Repairs & R. E. Maintenance	
224 Pay Roll Clerks		344 Farm Labor	
225 Supply "		345	
226 Janitor Servic		346	
227 Total Account 82		347	
228		348	
229 POWER PLANT		349	
230 Engineers		350	
231 Firemen		351	
232 Coal & Ashmen		352	
233 Sub-Station Attendants		353	
234 Water Supply		354 TOTAL PAYROLL	
235 " " Repairs			
236 Equipment "			
237			
238			
239 Total Account 91			
240 TOTAL COAL LABOR			

Charts Made From the Data on These Sheets Make the Fluctuations in Costs Graphic and Specific

In order to make this paper practical, I will confine myself almost entirely to certain analytical discussions of payroll costs of some of our mines, using actual reproductions of our cost charts with only the names of the mines and the total cost scales eliminated, and using actual letters passing between our operating officials to illustrate the manner in which costs can readily be interpreted and, if necessary, corrected. Certain vertical lines on these charts have been made heavier than others, to make it easier to follow the discussion.

Figures 3 and 4 show reproductions of the cost charts of a mine, which, for convenience, will be designated as "Mine No. 1." On March 11, 1925, the assistant general superintendent in whose district this mine is located wrote to the superintendent of this mine as follows:

"In looking over the graphic cost charts for the period ending February 28, 1925, the following is noticeable with reference to the costs at your mine:

"Your total labor cost increased \$0.060 per ton over the period ending February 15. This is the highest your cost has been with the exception of the period ending January 31, 1925, since the first half of September, 1924. A reduction in production of approximately 1,500 tons under the period ending February 15 may account for a part of this increase.

"Your yardage and deadwork cost for the period ending February 28 increased approximately \$0.025 per ton over the period ending February 15. Haulage and hoisting costs increased approximately \$0.03 a ton, or to slightly over \$0.35, which is the highest this particular division of your cost has been since the first half of May, 1924.

"Decreases in the cost for structural maintenance and repairs and also sundry labor are gratifying.

"In spite of the unfavorable increases, your total labor cost was \$0.100 less than it was in the last half of June, 1924, when the tonnage was identical. This improvement does not, however, justify the increases mentioned above."

On May 9, 1925, I wrote to the general superintendent and the assistant general superintendent of this division as follows:

"I wish to call your attention to the fact that although the tonnage at Mine No. 1 in the second half of April was practically identical with the first half of February, the labor cost has increased \$0.050 per ton. The following increases were especially marked: Mining, \$0.008; yardage and deadwork, \$0.022; animal and motor haulage, \$0.019; structural maintenance and repairs, \$0.011; superintendence, \$0.006.

"The total cost for the second half of April compares favorably with that of the last half of July and the first half of August, with almost similar tonnages,

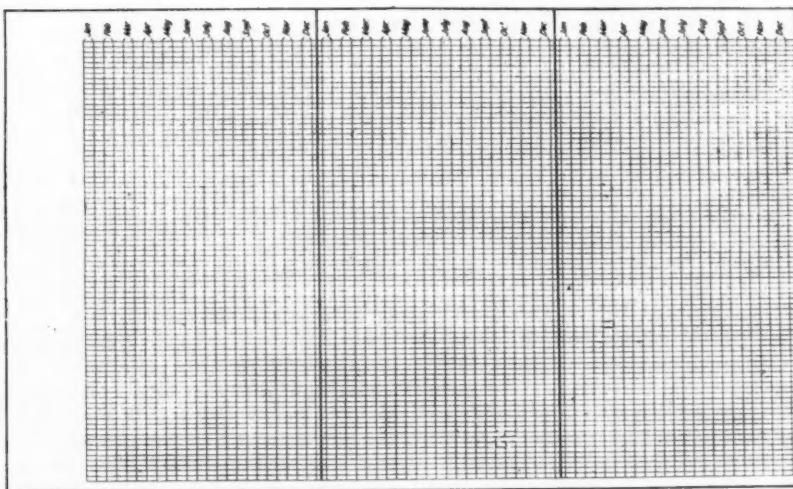


FIG. 2
Blank Chart Such as Used by the Hillman Coal and Coke Company

but the comparison with the more recent good costs at this plant is not so favorable. An investigation of the increase in animal and motor haulage is especially desirable."

Figures 5, 6, and 7 show reproductions of the cost charts of "Mine No. 2," in the same division. On March 11, 1925, the assistant general superintendent wrote to the superintendent of this mine as follows:

"I have before me the graphic cost charts for your mine for the period ending February 28.

"I note that your production for the period ending February 28 was approximately 4,000 tons under the production for the period ending February 15. With this reduction in tonnage, you were able to hold your total labor cost at approxi-

mately the same figure as for the period ending February 15.

"Your cost, however, is still considerably higher than it was during the months of June, July, August, and September, 1924, when the production was very much under that for the period ending February 28.

"Yardage and deadwork cost for the period ending February 28 shows a decrease of approximately \$0.02 per ton under the period ending February 15. Timbering, drainage, and ventilation have shown practically no change this year.

"Haulage and hoisting costs for the period ending February 28 show a slight increase over the period ending February 15. This particular division of your costs has increased slightly over \$0.06

per ton since the first half of January of this year, and should receive vigorous attention. Costs must be carefully watched and reductions made where possible."

On April 2, 1925, he wrote the superintendent as follows:

"The graphic cost charts for the period ending March 15, 1925, show that with an increased production of approximately 1,200 tons over the previous period, you were not able to make any reduction in your labor cost, but show rather an increase of \$0.01 per ton.

"A reduction of approximately \$0.02 per ton in your haulage and hoisting cost was more than offset by an increase of \$0.03 per ton in your yardage and deadwork cost.

"Please watch your costs carefully and make every possible reduction."

On May 9 I wrote to the general superintendent and the assistant general superintendent as follows:

"It is disappointing to note that the labor cost at Mine No. 2 in the second half of April was \$0.020 higher than in the first half of April, in spite of the fact that the tonnage increased 14 percent. It is true that although the tonnage was the same in the last half of April as in the first half of March, 1925, and in the first half of February, 1924, the labor cost was \$0.060 less than in the first half of March, and \$0.110 less than in the first half of February, but this does not seem to be any justification for the increase as shown between the two halves of April.

"Although decreases occurred in a number of the subdivisions, I wish to call your special attention to the following increases: Timbering, \$0.008; ven-

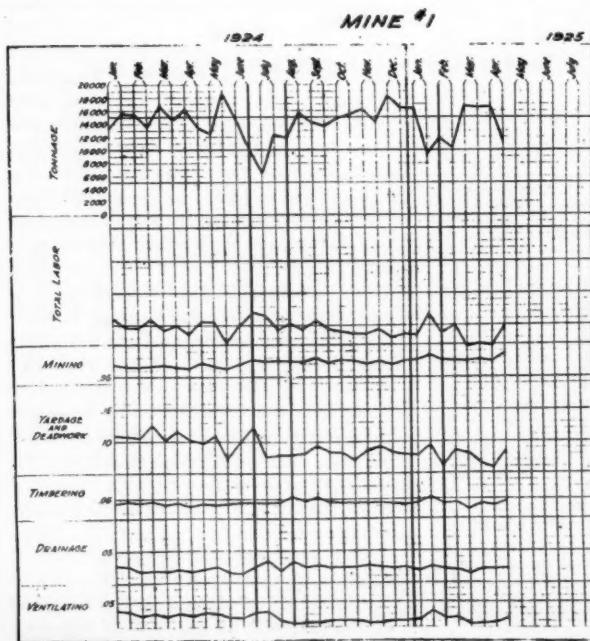


FIG. 3

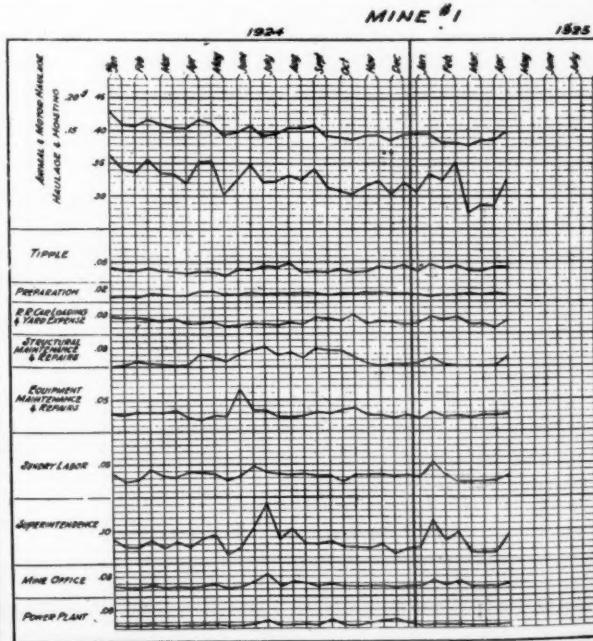


FIG. 4

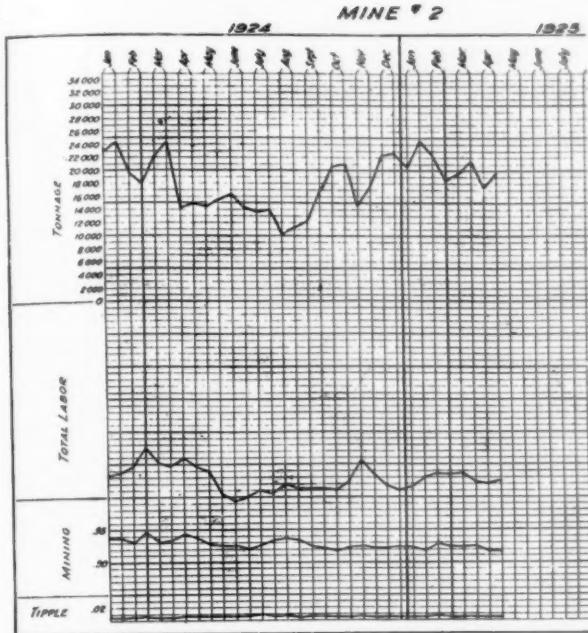
V
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FIG. 5

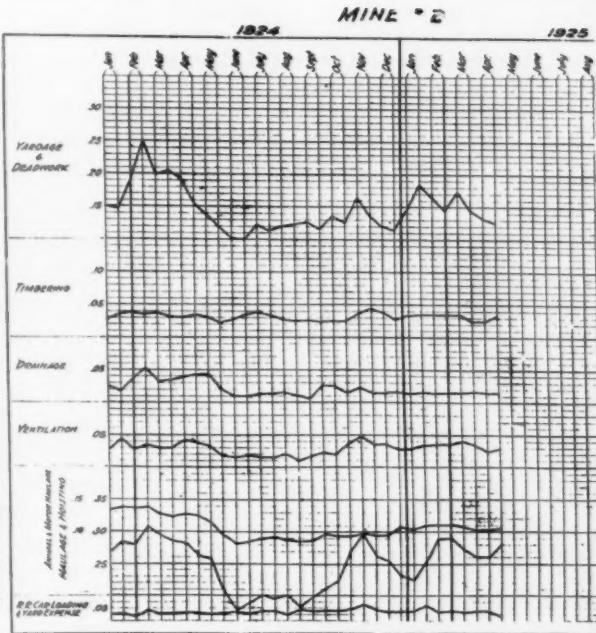


FIG. 6

tilation, \$0.006; haulage and hoisting, \$0.020; equipment maintenance and repairs, \$0.006, and sundry labor, \$0.008. Please investigate these increases."

Figures 8, 9, and 10 show reproductions of the cost charts of Mine No. 3, which, unlike the former charts, reflect the effects of a reduction in wages on April 25, 1924, to the 1917 scale. On May 9, 1925, I wrote to the general superintendent and the assistant general superintendent as follows:

"Although there has been a continuous decrease in the labor cost at Mine No. 3 between the last half of February

and the last half of April, due to an increase of about 14,000 tons in semi-monthly output, the total decrease of \$0.120 does not seem sufficient, inasmuch as the cost in the last half of April is only \$0.020 less than in the last half of January, when the production was 25,600 tons, compared with 29,300 tons in the last half of April. This increase of 14 percent in production should have carried with it a greater reduction in cost. The cost was the same as in the last half of June, when the tonnage was almost 12,000 tons less.

"I wish especially to call your attention to the fact that from the last half of January to the last half of April, yardage and deadwork increased from \$0.046 to \$0.072. Most of the other items of cost remained about constant, instead of reflecting the decrease in cost which would naturally be expected from so large an increase in production. The only decreases of any consequence between the two periods were in haulage and hoisting, which showed a decrease of \$0.010, in spite of the fact that animal and motor haulage alone decreased \$0.024, equipment maintenance and re-

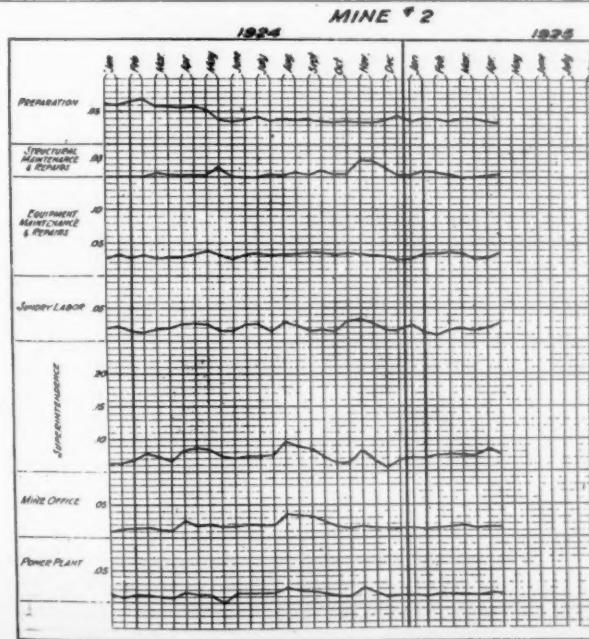


FIG. 7

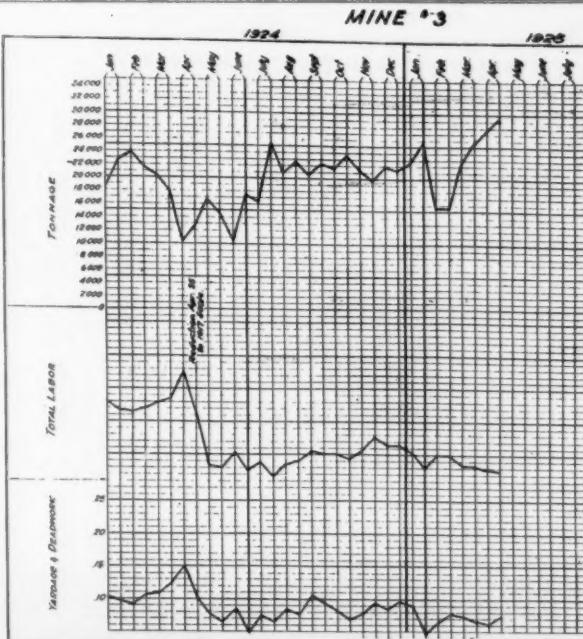


FIG. 8

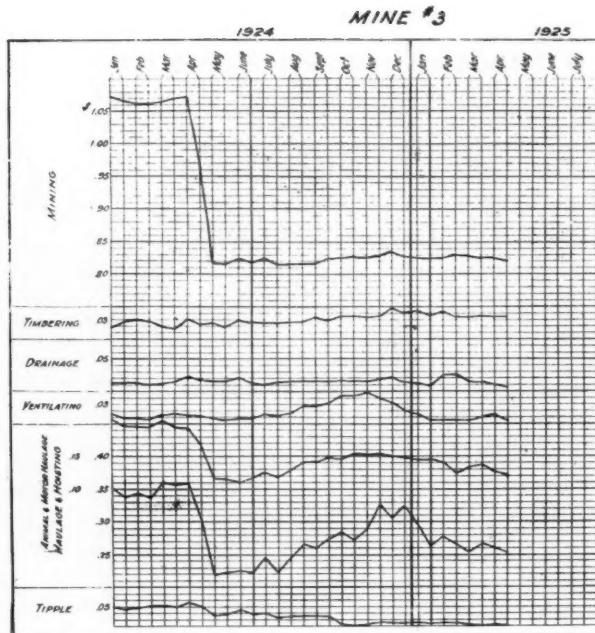


FIG. 9

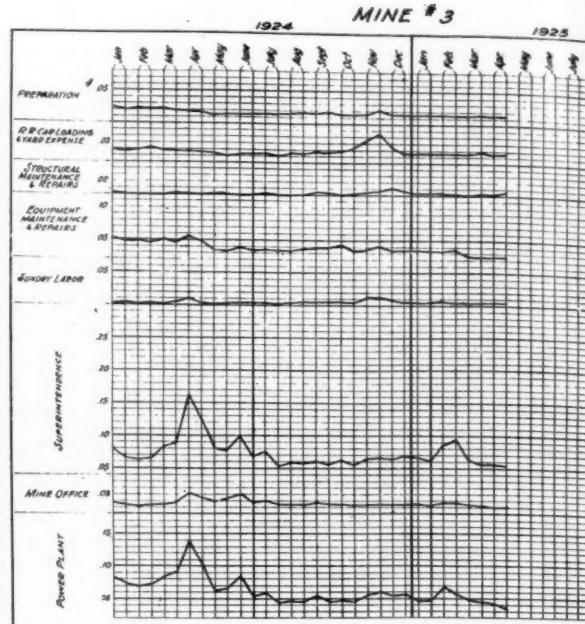


FIG. 10

pairs \$0.006, superintendence \$0.007, and power plant \$0.012."

Figures 11, 12, and 13 show reproductions of the cost charts of Mine No. 4, at which the wages were reduced to the 1917 scale on May 27, 1924. The 1920 scale was restored on December 16, 1924, and the 1917 scale was again established on March 16, 1925. Graphic charts are especially valuable in comparing costs under such fluctuations in wage scales. It is especially worthy of note in Figure 11 that with practically identical tonnage in the two halves of April, 1925, with the two halves of July, 1924, iden-

tical total labor costs were established, with so little fluctuation in the integral parts of the cost as to be unworthy of special note.

On January 29, 1925, I wrote the following letter regarding this mine, and the immediate results, as shown in the charts are interesting:

"I think that the cost at Mine No. 4 requires immediate investigation. A comparison of the last half of December and the first half of January discloses the fact that the cost in the latter period advanced \$0.09 per ton, even

though the production dropped less than 1,000 tons.

"Increases are especially acute in yardage and deadwork, timbering, drainage, and haulage and hoisting. This is one of the few mines which shows a very marked increase in cost since the advance in wages, as compared with the cost under the same scale of wages early in 1924."

Attention is especially called to the fact that in spite of a marked decrease in tonnage in the four semi-monthly periods which preceded the next wage scale reduction, a reduction in labor cost of

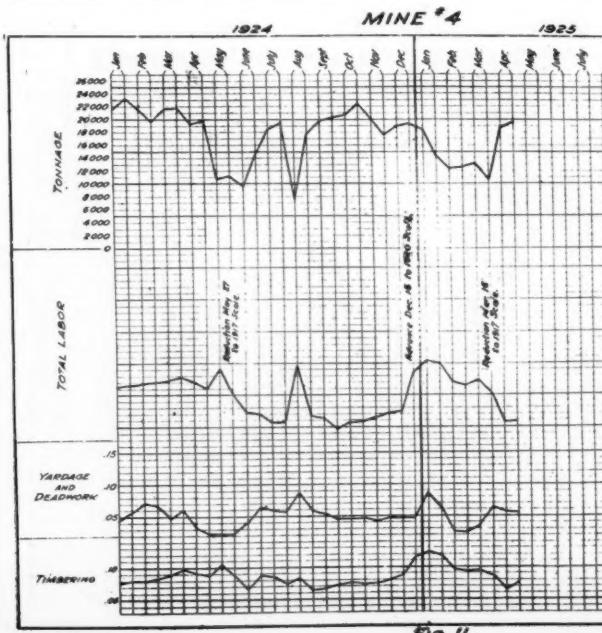


FIG. 11

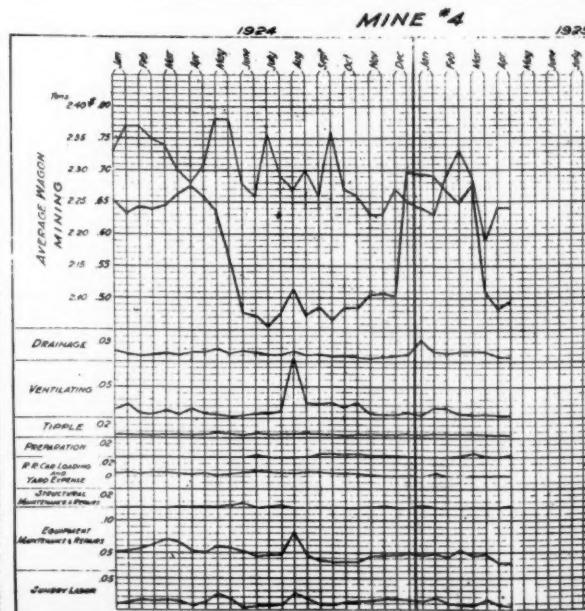
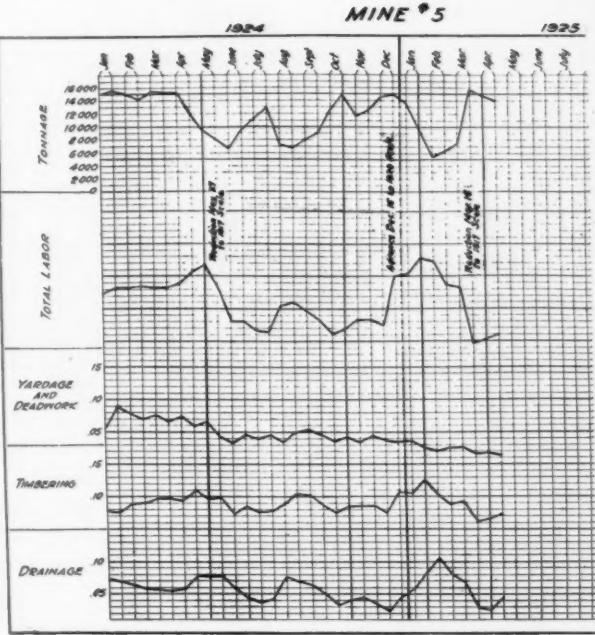
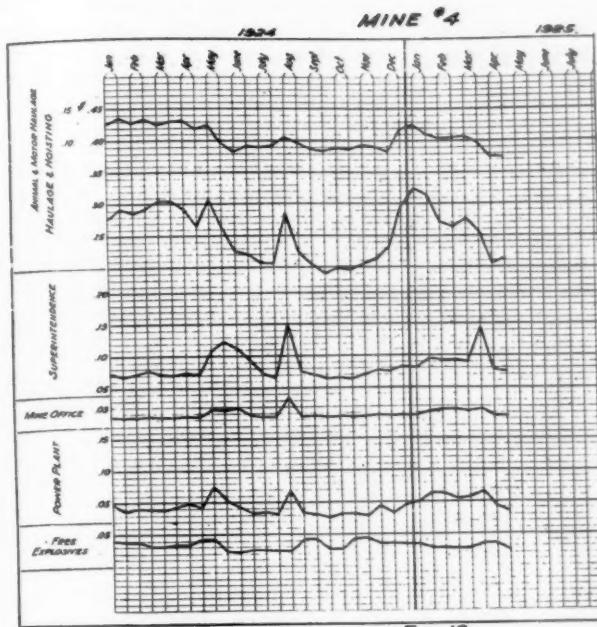


FIG. 12



\$0.15 was accomplished between the first half of January and the first half of March.

Figures 14, 15, and 16 show reproductions of the cost charts of Mine No. 5, which mine was subjected to the same wage scale fluctuations as was Mine No. 4. A discussion of the costs of this mine are especially interesting because replies to letters calling attention to increases are being submitted. Early in February, 1925, I wrote to the operating officials of the district in which this mine is located as follows:

"Mine No. 5's cost for the second half

of January does not compare favorably with the first half of May, on the same scale of wages, as the increase in cost for exactly the same tonnage is \$0.060.

"I wish to call your attention especially to an increase in timbering cost from \$0.095 to \$0.125, in mining cost from \$0.617 to \$0.646 (probably due to a drop of nine points in the wagon), and in haulage and hoisting cost from \$0.312 to \$0.409, part of which at least is probably due to the haulage extension work now under way."

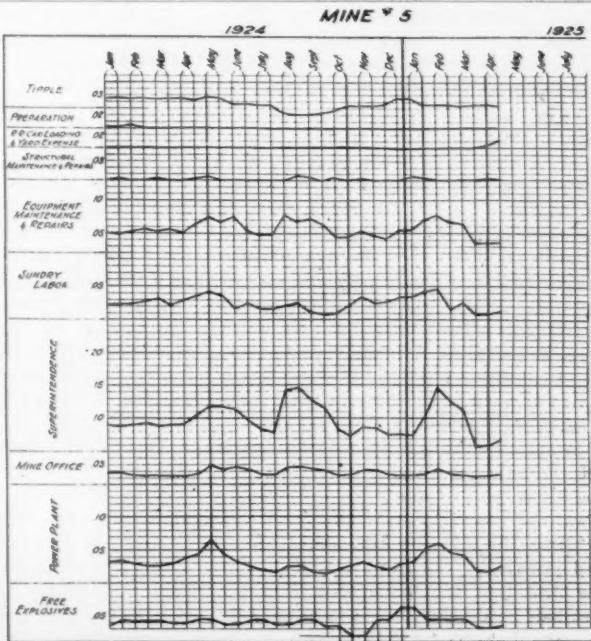
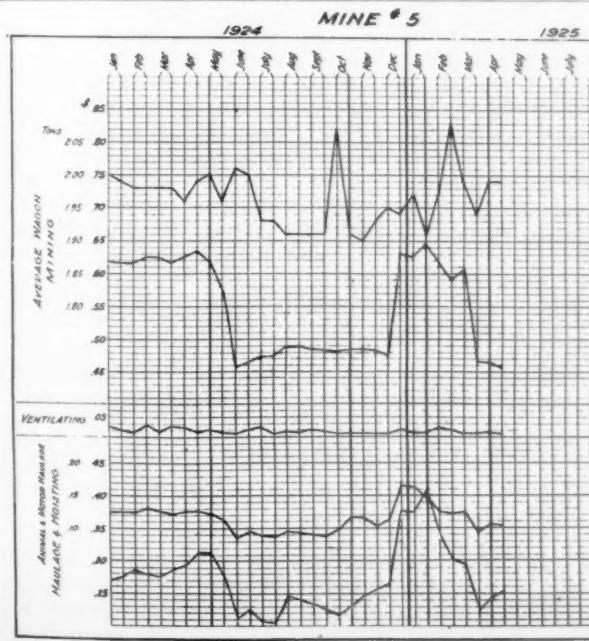
The assistant general superintendent replied with the following letter:

"Relying to your memorandum regarding Mine No. 5, I beg to state that I have gone into the matter in detail with the superintendent.

"We compared the costs during the first half of May with those in the second half of January, and found that in timbering the increase was due entirely to the employment of additional timbermen, made necessary by the intensive work that was done in C Flat.

"Mining costs increased from \$5,836.95 to \$6,375.44, largely on account of the increase in the amount of pick coal.

"Haulage and hoisting increased from



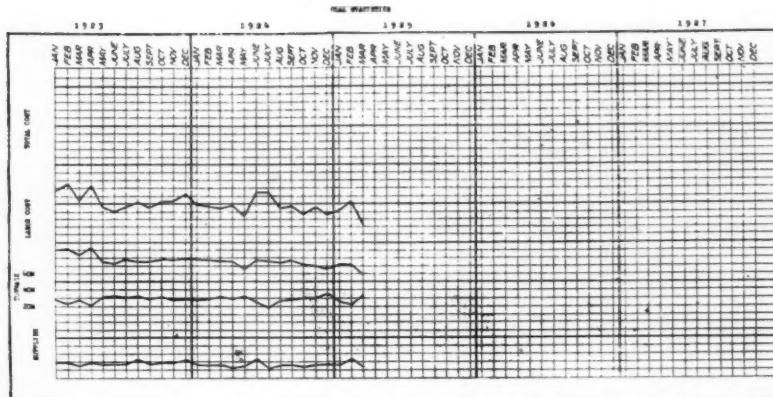


Fig. 17

Graphic Cost Charts Designed to Show Monthly Total Costs Over a Period of Five Years

\$2,946.76 to \$4,036.74, on account of increase in drivers from \$922.97 to \$1,114.57, plus \$58.16 for men employed in breaking in stock. The use of so much new stock resulted in a decrease in efficiency of both drivers and horses. There was an increase in the cost of snappers from \$7.55 in May to \$85.87 in January, due to the fact that last May the boss driver was helping out with the work of the snappers, whereas in January he was not able to do that work.

"Cleaning roads increased from \$32.75 to \$128.67.

"Haulage repairs increased from \$27.20 to \$1,024.45, for which the new haulage road was accountable for \$852.00. The new haulage road will soon be completed and as the day force has been reduced and the weight of the wagon increased, the costs in the immediate future should be considerably better than those that were mentioned in your memorandum."

It is needless to state that the preparation of the foregoing reply entailed such a thorough investigation of many angles of the cost at this mine, that the eyes of both the assistant general superintendent and the superintendent were opened to possible reductions in costs. That the investigation bore fruit is evident from the fact that, although the tonnage in the remaining three semi-monthly periods under the then existing wage scale was considerably less than in the last half of January, there was a continuous reduction in the total labor cost, aggregating 23 cents. Not a single subdivision mentioned in my letter failed to respond well to the corrective treatment to which it was subjected.

In spite of the consistent reduction in total labor cost, I found it necessary in the latter part of April to write as follows:

"Mine No. 5 in the first half of April had practically the same tonnage as in the first half of December and in the last half of October, but it is interesting to note that the total labor cost in the

first half of April was \$0.110 less than in the first half of December, and \$0.080 less than in the last half of October.

"The haulage and hoisting subdivision, however, is \$0.011 above what it was in the last half of October. It seems to me that this former figure should be duplicated."

The reply to this letter read as follows:

"In the first half of April haulage and hoisting cost \$3,567.71, compared with \$3,823.59 in the first half of December and \$3,425.10 in the second half of October. A large part of the increase in April as compared with October is accounted for by the fact that motor haulage repairs increased from \$14.00 to \$528.88, due to the construction of the new haulage road to the N—— headings. Other subdivisions of the cost are more in keeping with what might have been expected, although pit car repairs increased from \$116.10 to \$200.75, and drivers from \$1,095.07 to \$1,159.47."

Even though the principal item of increase, namely, the construction of an authorized haulage extension, was an entirely legitimate expense, the investigation disclosed an increase in expense for animal haulage, which is well on its way toward correction.

A more recent letter regarding the same plant, dated May 9, 1925, reads:

"Although Mine No. 5 had practically the same production in the last half of April as in the first half of December, the labor cost dropped \$0.070 per ton. In view of this drop, how do you account for the fact that the drainage cost increased \$0.020?"

"All other comparative figures are favorable."

This letter emphasizes my earlier statement that even with favorable reductions in total labor costs, unfavorable increases in certain subdivisions can only be detected by proper means of comparison and interpretation.

I might continue with a burdensome

number of actual illustrations of the method of cost analysis under consideration, but I feel that a sufficient number of illustrations has already been given regarding payroll costs. The impression should not be gained that this system entails a great multiplicity of letters. On the contrary, weaknesses are detected so readily and so specifically that correspondence is reduced to an absolute minimum. Most of the investigations made necessary by the apparent irregularities in costs are taken up by the operating officials directly with the superintendents on their numerous visits to the plants.

An entirely different type of graphic cost chart, designed to cover a period of five years, in monthly intervals, and showing supplies, labor, total cost including all overhead expenses, and tonnage, can be made to serve many useful purposes. These charts are 10 by 18 inches, with 1/6-inch vertical and 1/4-inch horizontal spacing. Figure 17 shows a reproduction of such a chart.

An inspection of this chart reveals, among other things, that the total cost for July, 1924, for a production of 19,000 tons, was about \$0.40 per ton higher than in March, 1925, when the production was about 33,000 tons. These charts are of very great value in conferences between the operating department and the sales department when the question frequently comes up as to what selling price must be approached with a mine operating at a certain tonnage. On the theory of "What man has done man can do," the operating department is able to predict with a very fair degree of accuracy where the dividing line between profitable and unprofitable business lies.

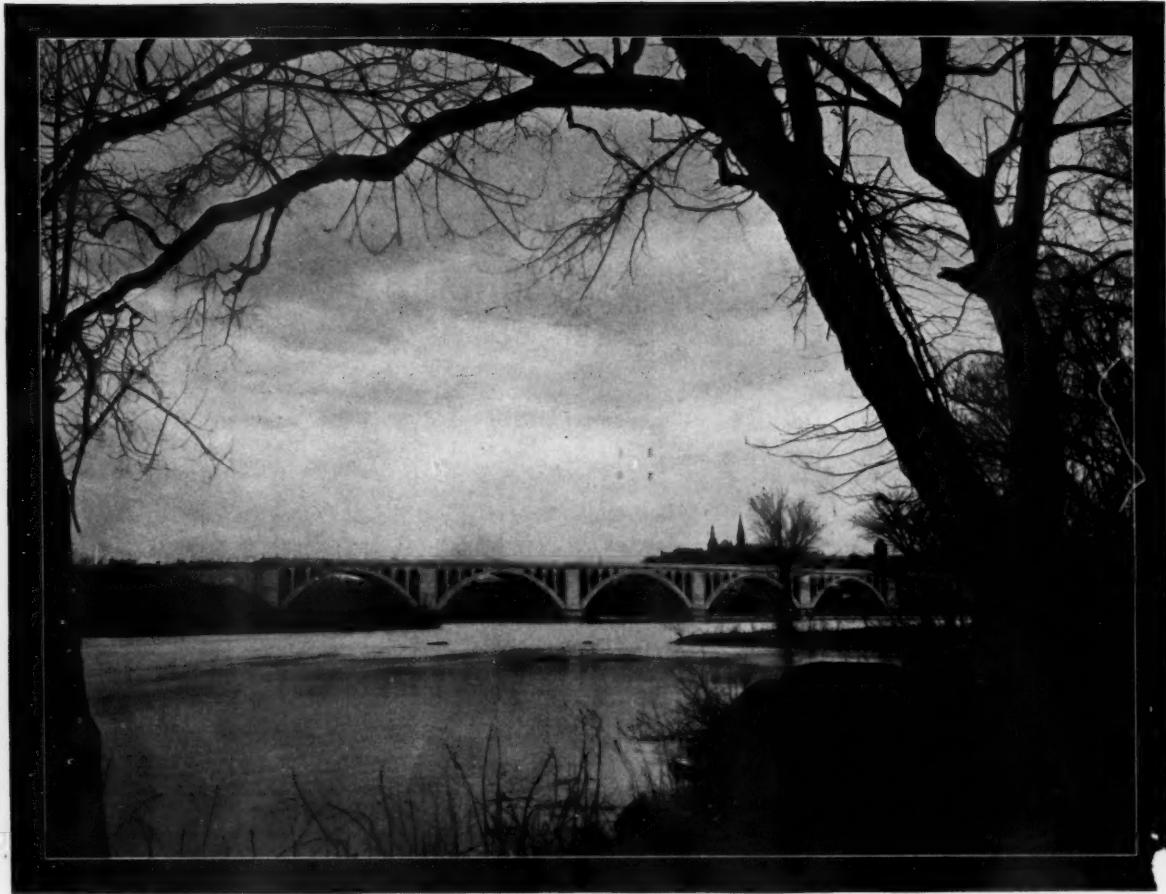
There are many other ways in which graphic charts can be used to advantage by operating officials as an aid in controlling, through proper interpretation, their costs. The method of application will necessarily differ somewhat with the individual problems of various companies but the construction and use of graphic charts is simple enough to enable any operating official worthy of the name, to obtain surprising benefits from their use.

Senator Fletcher, of Florida, has filed a protest with the Interstate Commerce Commission against a proposed reduction in freight rates on imported English china clay, from Eastern seaports to interior points at which American potteries are located. He says that an attempt is being made by English clay producers to secure American business, by slashing prices and securing low ocean and rail freight rates, in order to place English china clay in American potteries below the cost of production in Florida, Georgia, South Carolina and elsewhere.

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© Ernest L. Grana

KEY BRIDGE, WASHINGTON

The Washington end of beautiful new bridge leading from historic Georgetown to Arlington National Cemetery, Fort Myer and the Arlington Radio Station is built upon the spot where the Francis Scott Key home stood

POISONOUS GASES FROM EXPLOSIVES

Their Causes, Identity And Elimination—Adequate Forced Ventilation Must Be Maintained—Cooperation By User Vital To Successful Results—Seven Rules To Be Observed

By C. D. PRATT*

EVER since explosives were first used for blasting underground and in close operations, their gaseous products, commonly known as the "smoke" or "fumes," have not only been an inconvenience and an annoyance, but in some cases a source of danger when they contain appreciable amounts of poisonous constituents. In his endeavor to attain the maximum in efficiency and production, the consumer often finds these gases a great hindrance and looks largely to the explosives manufacturer to solve the problem of their elimination. In this age of advanced scientific development, it might well be expected that the explosives chemist could solve such a problem.

If he will but recall the experiences of a few years ago, the consumer will no doubt be impressed with the fact that there has already been a gradual advancement toward the elimination of this annoyance. No doubt a great deal has been accomplished through more efficient ventilating systems, but much may also be credited to the reduced production of the actively poisonous products by explosives.

It is the purpose of this article to outline the entire subject in such a manner as to enable the user to profit by the exhaustive investigations made and to realize that at least part of the responsibility must fall on him. It may also clear up a few facts about explosives that he is uncertain about and thus encourage him to install methods that will insure safety and efficiency.

The accurate description of an explosive, namely, a solid or liquid, which suddenly undergoes a transformation into gas with the giving off of heat, is sufficient to bring home the fact that foreign gases must be added to the surrounding mine air. The explosives chemist cannot do more than control the kinds of foreign gases generated.

Oxygen is the all important life supporting gas of the universe. It is found in unpolluted air to the extent of about 21 percent by volume, the remainder being almost entirely nitrogen, which has no active chemical effect on the human body. When foreign gases are added to air, the desirable proportion of 21 percent oxygen must therefore decrease and thus render it more difficult for the body to inhale it fast enough, just as a mountain climber finds it difficult to inhale enough of the rarified atmosphere

of high altitudes. Even though the foreign gases have the same harmless characteristics as nitrogen, in their effect on the human body, it nevertheless becomes evident that the gaseous products from the explosives must be diluted with more oxygen, in order to restore the healthy condition of the mine air.

Such a revivification, through the explosives themselves, even if it were chemically possible without the generation of actively poisonous gases, is not possible without great loss in efficiency of the explosives.

It is, therefore, evident that adequate forced ventilation must be maintained, even though the explosives are entirely free from the generation of actively poisonous gases.

There is perhaps not a single mining man who does not hesitate to enter a closed working after even the smallest fire. They all realize the great danger that lurks in the remaining gases, knowing how a piece of burning material robs the air of its life-supporting oxygen and leaves in its place not only the smothering carbon dioxide, sometimes called "chokedamp" or "blackdamp," but also the actively poisonous carbon monoxide, known as "whitedamp." Carbon monoxide is present wherever carbonaceous combustion is incomplete, and is almost invariably found after mine fires.

Carbon monoxide or "whitedamp" is the more dangerous because it has no odor, color or taste and becomes noticeable to the human body only by causing headache and general weakness, followed by sickness at the stomach, unconsciousness and eventually death. It is also the more dangerous as a poison, since its effects are cumulative. That is, a workman may be just as badly poisoned by working in the presence of small quantities of this gas for an extended length of time as he will be by working in a larger quantity of it for a shorter time. This is because the blood of the human body absorbs it so much faster than the oxygen breather can destroy its effect, that it is retained by the system for a long time.

Explosives, when properly compounded and used, are much less dangerous in this respect than mine fires. They take very little, if any, oxygen from the mine air, owing to the fact that the oxygen required to complete the combustion of their carbon contents is furnished by the

explosives themselves. For this reason, only small traces of the poisonous "whitedamp" or carbon monoxide are produced.

A rather exhaustive study has been made of the so-called "fume-properties" of the many types of commercial high explosives. For convenience, they may be divided into the three main classes, namely: Permissible explosives, dynamite and gelatin dynamites.

Permissible explosives include a number of widely different types and are employed almost exclusively for the blasting of coal, where the danger of gas or dust explosions is to be guarded against. They are, therefore, used nearly always in actual contact with coal—a combustible carbonaceous material—which has been found to act to varying extent as one of the ingredients of the explosives, in chemically entering into the explosives' reactions. It is thus made very improbable that the resulting "smoke" from the use of permissible explosives in direct contact with dry coal will ever be entirely free from the poisonous carbon monoxide or "whitedamp."

Dynamites, for the most part, are used for outside work, where there is little cause to be so particular about the poisonous properties of the gases evolved. In fact, through reliable investigations, the chemist and the explosives engineer have decided that the best blasting efficiency is attained by those dynamites that are not entirely free from the poisonous carbon monoxide or "whitedamp." It is, therefore, to the consumers' advantage to have them so, where the open air can be used for thorough ventilation.

Gelatin dynamites, however, find their principal employment in underground and close work where it is desirable to use the best water resistant and the most dense and cohesive explosive. They are used for driving rock-tunnels in coal mines, for ore blasting in metal mines, for excavating subways and the like, which makes it evident that this type of explosives must be as free from actively poisonous fumes as possible.

The gelatin dynamites have, therefore, been studied most carefully with respect to fumes and some very interesting and useful information has been collected through extensive field and laboratory investigations. Personal observations have been made under various conditions of mining from the lead and zinc fields of Oklahoma and the anthra-

* Reynolds Experimental Laboratory. Courtesy
Atlas Powder Co.

cite belt of Pennsylvania to the silver and gold areas of Northern Ontario.

Gelatin dynamite is unique in that but little variation can be made in the type, the chief explosive constituent necessarily being the gelatinized mixture of nitroglycerin with nitrocotton. It, like most other commercial high explosives, has two principal parts, namely, the explosive mixture and its wrapper.

The wrapper or cartridge shell consists of a paper envelope coated or impregnated with some waterproofing material such as paraffin. By chemical analysis, it has been found that nearly all types of wrappers have insufficient oxygen in their composition to completely oxidize or burn all of the carbon and hydrogen present in the wrapper, but it has also been possible, through the same means, to determine in each case the exact amounts of oxygen necessary to complete their combustion.

When making gelatin dynamite, it is, therefore, necessary to include sufficient oxygen in its composition to provide for the deficiency in its wrapper and, by accomplishing this, there is attained what is termed a perfect "oxygen balance" for the assembled explosive. Such a carefully balanced gelatin, when properly exploded under ideal conditions, would produce no carbon monoxide or "whitedamp" whatever, with the formation of only the following gases, none of which are actively poisonous, namely, free nitrogen, water vapor and carbon dioxide or "chokedamp." Free nitrogen will be readily identified as the chief constituent of pure air. Water vapor comes from the complete oxidation of the hydrogen and the carbon dioxide from the complete oxidation of the carbon.

The oxygen balance in an explosive must be maintained within very close limits as otherwise there is a liability of producing not only carbon monoxide but also various oxides of nitrogen, which are also poisonous. A deficiency of oxygen, on the one hand, may produce carbon monoxide, whereas an excess of oxygen may produce oxides of nitrogen on the other.

The poisonous oxides of nitrogen, unlike the "whitedamp" or carbon monoxide, are quite noticeable to the senses. They may be identified by their sharp sickening odor and their catching effect on the lungs, followed by coughing, in fact, a general irritating action on the membranes. In severe cases, bloody mucus will be coughed up, producing symptoms of pneumonia. It is a peculiarity of such poisoning that the immediate symptoms often disappear shortly after the person emerges from exposure to the gases, but they later return in the form of severe pneumonia or edema, often resulting in death.

The properly balanced explosive, already referred to, thus represents the best possible chemical attainment toward the elimination of poisonous gas formation. A qualification to this statement has already been mentioned, however, which is that *the explosive must be used under ideal conditions.*

The proper use of the explosive is a matter of prime importance to the manufacturer, as he is not able to make an explosive entirely foolproof, and it is only with the hearty cooperation of all the users of explosives that the danger and hindrance, due to the generation of poisonous gases, may be successfully eliminated.

First of all, the gelatin dynamites should be used in their fully assembled condition; that is, with the entire wrapper in place. It is on this basis that all of the work of the explosives chemist has been founded and the consumer destroys the careful balance established, when he removes the wrappers. This does not refer to the practice of slitting the cartridges in order to obtain a tighter charge, but it does apply to the removal of the wrappers, even though they be used for tamping. In other words, by using the wrappers in as intimate contact with the gelatins themselves, as possible, the consumer is assured of a minimum of poisonous gases and the maximum strength of the explosive.

The proper and complete detonation of the explosive is of the greatest importance and is a matter that requires serious attention. There are many seemingly unimportant items involved in this, any one of which might be easily overlooked in the field, and the neglect of which might be serious enough to cause dangerous consequences. Commercial high explosives of all kinds require a detonator to liberate their energy at the time it is desired. In fact, they will often burn completely when ignited, without exploding at all. When burned, however, the decomposition takes an entirely different course than when they are exploded properly and produces large quantities of not only the poisonous oxides of nitrogen, but the dreaded "whitedamp" as well. It is to guard against anything of this kind that the following precautions should be taken by every user of explosives:

1. Be sure that the detonators or caps are strong enough to explode the powder properly, nothing weaker than a No. 6 should be used. No. 8 caps are often employed to provide a margin of safety.
2. Be sure that the caps or detonators are absolutely dry, remembering that even slightly damp caps are often of less value than dry ones of a lower grade.
3. Avoid using gelatins that have become insensitive through age or improper storage.
4. Avoid contact between the fuse and the explosive as much as possible, for the side-spit may ignite and burn some of the explosive before it has a chance to detonate.
5. Be sure that the explosive is packed into the bore-holes so that there are no breaks in the train of explosive, which might cause the wave of detonation to be interrupted.
6. Be sure the explosive is properly confined, not only with tamping but also by solid bore-holes. Rock seams have been known to cause a similar effect to that of a "blow-out" shot.
7. Avoid the use of even partially frozen explosives. The danger of frozen gelatin has now practically been eliminated by the manufacturer, nevertheless in extreme climates, it should not be entirely forgotten.

Field observations have shown that properly balanced and compounded explosives, although practically free from both carbon monoxide and oxides of nitrogen when properly detonated in dry bore-holes, tend to produce the oxides of nitrogen in wet bore-holes, but without a marked increase in the production of carbon monoxide. It is, therefore, left largely to the user of the explosive to avoid excess nitrogen oxides from wet holes by taking greater pains to blow them out dry and by loading and shooting them as quickly as possible.

The danger of poisoning at such locations, where oxides of nitrogen are suspected of being produced, may also be further guarded against through the use of a water spray on the muck piles and neighboring walls, as these gases are quite soluble in water and will disappear more quickly when a spray is used, which settles the dust as well. Carbon monoxide or "whitedamp," however, will not be appreciably affected by water, as its solubility therein is comparatively small.

But even careful observation of these precautions will not entirely eliminate the formation of poisonous gases, unless all foreign combustible materials are kept from contact with the explosives, at the same time. The use of fuse, for example, may overbalance the fumeless advantage of gelatin. In fact, the only way to avoid entirely the formation of carbon monoxide or "whitedamp" is by using instantaneous electric blasting caps wherever possible, and delay electric blasting caps where they are requisite.

The oxygen content of explosives has been increased experimentally in the hope of counteracting the ill effects of

fuse, but this has only resulted in destroying the proper balance of the explosive itself.

The odor of hydrogen sulphide, resembling that of rotten eggs, when noticed in sulphide ore mines, should also be taken as a danger signal, as this is quite a poisonous gas. Its formation from the properly balanced gelatin itself is not possible, but in contact with sulphide ores such as galena, its production might be expected.

There are also many other natural causes for the formation of various gases in underground workings, but as they are not produced by the explosives, their description is somewhat out of the scope of this article.

For example, in many localities, the compressed air exhausts from drills and other underground machines is the only means of revivifying the mine-air, but when produced by mechanical compressors, it is sometimes high in the content of carbon monoxide. This has been traced to overheated and leaky compressors, wherein the lubricating oil is partly oxidized, thus producing the objectionable constituent along with the compressed air.

In the Cobalt silver area of Northern Ontario, hydraulic compressed air is used almost universally for ventilation. This air was found to be as low as 17.6 percent in oxygen. Although free from actively poisonous gases, a match would not burn in it, so that it may well be deduced that it would be more difficult for a miner to thrive in it.

It is hoped that the above remarks are sufficiently clear to give the general user of explosives some idea as to what the explosives manufacturer has accomplished in the elimination of poisonous gas from his product, and the necessity for cooperation by the user. When the user realizes that at least part of the responsibility must fall upon himself, he will doubtless take those precautions which are beyond the control of the manufacturer and which will increase his own safety, comfort and efficiency.

MINING INDUSTRY CONSUMES LARGE PERCENTAGE OF EXPLOSIVES

In the United States the mining industry consumes a larger quantity of explosives than any other single industry, states W. W. Adams, statistician, Bureau of Mines, Department of Commerce, in Technical Paper 380, recently published. About 86 percent of all of the black blasting powder sold in 1924 was used in mining; nearly 96 percent of all permissible explosives was so used, and more than 51 percent of high explosives other than permissibles. If stone quarries were included, the figure for high explosives would be increased to perhaps 68 percent.

Most of the black powder and permissible explosives are used in coal mines; relatively small quantities find their way into metal or other mines. Of high explosives other than permissibles, the metal mines and stone quarries are the principal consumers, although large quantities are also used in the anthracite or hard-coal mines and small quantities are used at bituminous coal mines.

Bituminous coal mines in 1924 used 165,543,000 pounds of all classes of explosives. This quantity represented 342 pounds of explosives for each thousand tons of coal produced. Of the 342 pounds of explosives, 73 pounds were permissibles, 20 pounds were other high explosives, and 249 pounds were black powder. Permissibles, therefore, constituted about 20 percent or one-fifth of the total quantity of all explosives used in mining bituminous coal. Eight years ago, in 1917, permissibles formed only 11 percent of the total quantity of explosives used.

Anthracite mining in 1924 used 63,837,117 pounds of explosives; this quantity represented 709 pounds of all classes of explosives per thousand tons of coal produced. Of the 709 pounds of explosives per thousand tons of coal mined, 188 pounds were permissibles, 298 pounds were other high explosives, and 223 pounds were black blasting powder. Permissible explosives, therefore, represented nearly 27 percent of all explosives used by anthracite miners in 1924, as compared with a little over 12 percent in 1917.

The increasing use of permissibles instead of other types of explosives for coal mining is encouraging to persons interested in mine safety. Although explosives are not one of the major causes of accidents in coal mines, they constitute a hazard. Hence it is gratifying to note that permissibles are replacing other types of explosives, particularly in gaseous or dusty coal mines where explosives not of the permissible types may cause terrible disaster. About 4 out of 10 of the more disastrous explosions in the United States have been caused by ignition of gas or dust by explosives.

Utah, New Mexico, Alabama, Pennsylvania (bituminous), Washington, West Virginia, and Colorado have led all other states in the use of permissibles instead of other types of explosives.

States using the largest quantities of explosives in proportion to total output of coal during the past eight years were Kansas, Georgia, Arkansas, Iowa, and Alaska.

The smallest consumption of explosives in proportion to coal production was in Pennsylvania (bituminous), New Mexico, Colorado, Utah, and West Virginia. All five of these States are among those using the highest percentage of permissibles as compared with other classes of explosives.

SIXTH ANNUAL SAFETY CONFERENCE

ARRANGEMENTS are practically completed for the sixth annual mine safety conference which will be held under the auspices of the Lake Superior Mining Section of the National Safety Council, at Hibbing, Minn., on August 25 and 26. William Conibear, of Ishpeming, Mich., is chairman.

The program follows:

August 25, 10 A. M.—Address, Frank O. Botsford, district manager, Pickands, Mather & Co., Hibbing, Minn.; paper, "Stray Currents," A. J. Hermann, electrical engineer, Oliver Iron Mining Co., Hibbing; papers, "Underground Haulage," Anton Tancig, mechanical superintendent, The Shenango Furnace Co., Chisholm, Minn., and Lucien Eaton, superintendent, The Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Afternoon session, 2 P. M.—Mine Fatalities, Mesaba Range, Vermillion Range, Edward Smith, mine inspector, St. Louis County, Minn., Gogebic Range, A. A. Rawden, range safety inspector, Pickands, Mather & Co., Ironwood, Mich.; Menominee Range, J. P. Chappel, safety engineer, Oliver Iron Mining Co., Iron Mountain, Mich.; Crystal Falls, Iron River Range, A. H. Trestrail, range safety inspector, Pickands, Mather & Co., Caspian, Mich.; Marquette Range, H. T. Hulst, mining engineer, Oliver Iron Mining Co., Ishpeming; All Accidents, Lake Superior Mining Industry, William Conibear, safety inspector, The Cleveland-Cliff Iron Company, Ishpeming.

August 26, 9 A. M.—Address, "Who is Responsible for Accidents?" W. Dean Keefer, chief engineer, Industrial Safety Division, National Safety Council, Chicago; paper, "Some Safety Practices in Metal Mines of the West," F. C. Gregory, district engineer, Bureau of Mines, Duluth, Minn.; paper, "The Use of Goggles at Metal Mines," C. A. Kingsbury, safety division, American Optical Co., Chicago; business session.

The committee in charge of the conference comprises: Durant Barclay, Coleraine, Minn.; A. C. Borgeson, Chisholm, S. J. Siocotte, Hibbing, B. H. Middlemiss, Hibbing, and William Conibear, of Ishpeming, Mich.

Three sessions will be devoted to the mining section at Fourteenth Annual Safety Congress which will be held under the auspices of the National Safety Council at Cleveland, Ohio, from September 28 to October 2, inclusive.

The Bureau of Mines has issued technical paper, No. 376, on "Permissible explosives, mining equipment and rescue apparatus approved prior to January 1, 1925." J. E. Crawshaw, L. C. Ilsley, D. J. Parker and A. C. Fieldner are the authors.

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SIZE OF HOSE FOR FIRE-FIGHTING

Bureau Of Mines And Illinois Geological Survey Conduct Investigation To Determine Most Effective Combination Of Hose And Water Pressure

A SERIES of tests designed to ascertain the most suitable hydrant pressures and sizes of hose and nozzles for use in fighting fires occurring in mines has been completed by the Bureau of Mines, with the cooperation of the Illinois Geological Survey and the University of Illinois. The investigators found that the most effective combination of fire hose and water pressure for use by one man fighting a mine fire is that which gives a stream with maximum trajectory in a limited headroom and delivers the greatest volume of water. It also must be of such weight and flexibility that a man of ordinary weight and strength can advance or retreat with the hose while playing it on the fire. It must not give a reaction that will wrench the nozzle from the operator's control when the water is suddenly turned on at the supply valve. It must not cause vibration that will numb the muscles of the operator or exhaust his strength within a reasonable length of time; and it must be such that the hose if accidentally dropped can be recovered without chance of injury to the operator. The tests, which were conducted at the Chicago laboratory of the National Board of Fire Underwriters, were intended to check previous investigations made by the Bureau of Mines at its experimental mine at Bruceton, Pa.

The main object of the tests was to ascertain the equipment and pressures with which a man of average weight and strength, without assistance, could fight a mine fire most effectively. An ordinary miner may be unfamiliar with the direction and reaction of the forces developed when water under high pressure is suddenly turned into a hose line, he may be in darkness, he may have to walk or crawl over rough places, and he may be nervous or highly excited. There is always the chance that the hose line will warp and the sudden reaction will knock the man off his feet, or under an extremely high pressure the nozzle may get away from him and perhaps stun him if it hits him.

The scope of the tests included the probable movements of a man endeavoring to turn a stream of water on a mine fire. He might unreel 50 feet of hose; then, with the nozzle in one hand, open the hydrant valve and advance toward the fire dragging the slack of the hose after him.

Furthermore, as one man, single handed, may have to fight a fire for some time, the apparatus and pressures should be such that his muscles would not become numb from the vibrations of the

hose; nor should he become too fatigued by reason of the exertion necessary under the conditions that would prevail in the average mine.

These points were kept in mind in making the series of tests to determine the ability of one man to manipulate a hose line at different pressures. The tests comprised stretching a line of 50 feet of 1½-inch hose with different warps and bends and using hydrant pressures ranging from 30 pounds to 150 pounds per square inch. The nozzles were all cone-shaped and ranged from seven-sixteenths inch to seven-eighths inch in diameter. A few similar tests were made with 2½-inch hose.

As a result of the tests it was evident that, in fighting underground fires, a 2½-inch hose is too heavy and too hard to handle. With a three-fourths-inch nozzle the volume of water it delivers at the lower pressure is not enough larger than that which a 1½-inch hose delivers through the same nozzle to overcome the disadvantage of extra weight.

The maximum hydrant pressure that produces the most effective stream through 50 feet of cotton rubber-lined hose is around 45 pounds per square inch. At much higher pressure the body of the stream is shattered.

The data obtained show that the three-fourths-inch nozzle apparently gives the most effective stream with 50 feet of 1½-inch cotton rubber-lined hose. However, as the distance of the nozzle from the hydrant increases the nozzle pressure decreases, owing to the friction of the water against the inside of the hose; therefore the hydrant pressure should be increased as the length of the hose line is increased.

An interesting point is the ability of different types of fire hose to resist deterioration under mine conditions, especially where the mine water is sulphur bearing. Rubber-covered cotton rubber-lined hose seems likely to give better service in mines where the hose is liable to be subjected to contact with sulphur compounds. Ordinary cotton rubber-lined hose deteriorates rapidly when its exterior comes in contact with weak solutions of sulphuric acid. It is recommended that all fire hose bear the inspection label of the Underwriters' Laboratories.

The results of these tests are given in Technical Paper 330, by L. D. Tracy and R. W. Hendricks, copies of which may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

SAFETY EXTENSION SERVICE

A N extension of the work of the Bureau of Mines for greater safety in mining operations is the purpose of a new subdivision of the Safety Service of the Bureau, which began to function July 1, coincidentally with the transfer of the Bureau to the Department of Commerce from the Department of the Interior, according to an announcement by Dr. D. A. Lyon, acting director.

J. J. Forbes, who has served as district engineer in Alabama, has been designated as the chief of the new subdivision which will be known as the Safety Extension Service. The new subdivision, with the Mine Safety Service, which, under D. J. Parker as chief engineer, has performed notable rescue work at numerous mine disasters and trained thousands of miners in mine rescue and first aid methods, will make up the Safety Service of the Bureau, under Dr. T. T. Read, Safety Service Director.

About half the deaths in coal mining result from falls of roof or coal, while in metal mining approximately one-third of the deaths result from similar causes. The death rate from these causes is nearly three times as large in some states as it is in others. Efforts to bring about a reduction in the number of these fatalities have not so far shown substantial results in the United States. Since the individual miner is the one who can do most to exercise precautions against the hazard from falls of coal or rock, one of the principal duties of the new Safety Extension Service will be to perform such educational work in mining communities as should influence the miner to take greater precautions against such accidents. One of the most effective methods so far undertaken in this connection is the organization of local safety societies forming a series of units in a national organization known as the Joseph A. Holmes Safety Association, named in commemoration of the first director of the Bureau of Mines, a pioneer in the industrial safety cause in the United States. These local safety societies serve to stimulate interest in mine safety work by affording opportunity for the individual miner to strive personally to prevent accidents and promote safety. Mr. Forbes, chief of the newly organized Safety Extension Service, has, in the course of his work in Alabama, demonstrated that successful results can be attained by this form of cooperation with the individual miner, and in his new position will have an opportunity to extend his methods to other mining districts in the expectation that equally good results can be obtained in these districts.

In addition to cooperating with local chapters of the Joseph A. Holmes Safety Association in promoting interest in ac-

ident prevention and first aid training in mining communities, the new Safety Extension Service will, in cooperation with the Mine Safety Service and the Mining Research Division, make field demonstrations and exhibits to illustrate and explain the safety methods, equipment and procedure recommended by the Bureau of Mines. The Service will endeavor to demonstrate to the mining industry the value of the findings of the scientific investigations of the research division relating to safety and to encourage the practical adoption by the industry of approved recommendations. The Service will plan and conduct, wherever practicable, advanced instruction in organization for fighting mine fires and conducting mine rescue and recovery operations. The function of the new service will be, in brief, to utilize every practicable means that will lead to more general adoption, by the mining industry, of the safety practices and devices recommended by the Bureau.

AVAILABLE PERMISSIBLE EQUIPMENT FOR COAL MINES

ONE phase of the Bureau of Mines work in the interests of safety, has been the investigation of various types of machines to determine whether or not their use would constitute a hazard should they be operated in a mine where explosive atmospheres of gas or dust might be encountered. The machines that have been approved by the Bureau, after meeting the inspection and test requirements, are as follows:

1. Three electric coal drills (direct current).
2. Thirteen mining machines of the shortwall type. Ten of these are for direct current circuits and three for alternating current circuits.
3. Two mining machines of the slabbing type (direct current).
4. One room hoist (direct current).
5. One air compressor (direct current).
6. Eight storage battery locomotives for gathering service.
7. One storage battery power truck for supplying power to operate approved mining machines, thus avoiding the necessity for wiring in the mine.

In addition to the above machines which the bureau classes as "permissible," the following additional classes of equipment are in course of investigation:

- (1) Pumps; (2) Underground loading machines; (3) storage battery locomotives for main line haulage service; and (4) junction boxes.

—J. A. Holmes Safety News.

PREVENTING COAL-DUST EXPLOSIONS

AN important step in the prevention of explosions in coal mines has been taken by the formulation, through the cooperative effort of all interested groups, of a comprehensive code for rock dusting coal mines, according to an announcement by the American Engineering Standards Committee. Catastrophes due to coal mine explosions can be prevented by the simple expedient of spreading rock dust thickly enough to cause an incipient coal dust explosion to die out rather than to travel through the mine atmosphere.

The code is now practically completed, and it is expected that it will be formally approved and issued in the near future. The code prescribes the rock dusting of mines producing bituminous coal or lignite, whether gaseous or not, as they are liable to dust explosions.

The kind of dust to be used is specified as to its nature, fineness and moisture-absorbing qualities, since caking destroys its effectiveness. The parts of the mine to be dusted, the methods of applying the dust, and the amounts are indicated. Instructions for sampling the dust for inspection purposes are given.

Supplementary to the code itself, and mentioned because of their immediate relation to the explosion hazard, there are recommended: The practice of wetting coal dust produced by machines used in undercutting the coal and the practice of wetting mine cars in transit by automatic drenching sprays.

The technical committee which has formulated the code is made up of representatives of the various national bodies interested, acting under the sponsorship of the American Institute of Mining and Metallurgical Engineers. The groups cooperating and represented on the committee include state officials having regulatory power over the field in question, coal operators, labor, inspection, insurance, and manufacturers of mine equipment, the American Mining Congress, and the United States Bureau of Mines which, as a leader in mine safety work, has made extensive investigations and experiments under the direction of Dr. George S. Rice.

The chairman of the sectional committee is Howard N. Eavenson, of Pittsburgh, a well-known consulting engineer and mining expert.

ROCK-DUSTING SAVES 135 LIVES AT MINE EXPLOSION

ACCORDING to a statement by the Joseph A. Holmes Safety Association, on June 8, 1925, an explosion occurred where a miner drilled into a strong feeder of firedamp, which was ignited by the flame from his open light. Seventeen men were killed and the lives

of 135 more were endangered. The explosion was localized by rock-dusting.

The entry in which the explosion originated had not been treated with rock dust, but upon reaching the entries that had been rock-dusted the flame was extinguished and the explosion died out. This is the first recorded instance where a mine with rock-dusted entries has had an explosion occurring. It is of paramount importance to note that rock dust stopped the explosion and was instrumental in saving so many lives. Those who have been skeptical of the efficacy of rock-dusting must now concede that it is the ideal method of preventing explosion propagation.

The Bureau of Mines has just issued a new Bulletin, No. 247, on "Sources of Limestone, Gypsum and Anhydrite for Dusting Coal Mines to Prevent Explosions," by Oliver Bowles. There are 10 pages at the beginning that discusses coal-dust explosions and the value of rock dust in preventing and limiting them. Following this are lists of quarries that produce rock suitable for crushing and dusting, accompanied by maps of western Pennsylvania, West Virginia and western Maryland, western Virginia, Kentucky, eastern Tennessee, northern Alabama and northwestern Georgia, Ohio, Indiana, Illinois, eastern Oklahoma and Arkansas, eastern Kansas, Missouri, and southern Iowa, New Mexico, Colorado, Utah, and southern Wyoming, Montana and northern Wyoming, and Washington.

THE COMMERCE YEARBOOK FOR 1924 NOW READY

THE third issue of the Yearbook of the Department of Commerce is ready for distribution. In their announcement the Department states that this third issue presents a concise, readable, and graphic picture of the world's industry and commerce for 1924, with special reference to the United States; comprises 718 pages, and represents the best economic information available for the year. All the statistics included were taken from reliable governmental and commercial sources, and the surveys and analyses were made by highly competent business observers and specialists, located in all parts of the world.

Some of the interesting features are: A foreword by Secretary Hoover.

A summary of the general trend of business through the year with a discussion of the basic factors that influenced trade.

A survey of industrial production.

A record of wholesale and retail prices.

A detailed discussion of finance, banking, and the security markets.

A study of developments in various leading industries.

Essential data on transportation.

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THE AMERICAN MINING CONGRESS NOW A MEMBER OF A. E. S. C.

THE membership list of the American Engineering Standards Committee has recently been increased with the admission of the American Mining Congress which becomes now a regular member body with one representative, James F. Callbreath, and one alternate, Col. Warren R. Roberts.

The American Mining Congress is extensively engaged in standardization activities, having an entire division of the Congress devoted to the subject. Under the division are two general committees, one on coal mining and one on metal mining. Under the first of these there are operating 25 committees and subcommittees and under the second 21 committees and subcommittees. Working on these committees are several hundred engineers.

The Congress was already taking a very active and important part in the work of the American Engineering Standards Committee. For example, it holds sponsorship for nine standardization projects in the mining field.

CLEANING COAL

CLEANING tests of Central Illinois coal, conducted by the Bureau of Mines, Department of Commerce, in cooperation with the Illinois State Geological Survey and the University of Illinois, indicate that by the use of proper washing methods the screenings and nut-coal sizes of the important No. 6 seam may be made to yield a considerably improved clean coal product, containing no more than 10 to 11 percent of ash. The development should prove of value to operators in that district as in recent years higher freight rates have created a demand for cleaner coal.

That Illinois coal producers have contributed much to the development of better preparation of bituminous coal for the market is pointed out by Thomas Fraser, consulting engineer, and H. F. Yancey, associate chemist, authors of Technical Paper 361 of the Bureau of Mines, in which the results of the tests are discussed. More careful sizing and hand picking and the early introduction of the shaker screen and the screening plant have evidenced this development. Mechanical processes of coal cleaning have aroused much interest, although actual construction of cleaning plants has been rather sporadic. Until recently progress of this kind has been slow because of lack of interest among coal consumers rather than producers.

Copies of Technical Paper 361, "Cleaning Tests of Central Illinois Coal," may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

PRACTICAL OPERATING PROBLEMS TO BE DISCUSSED

Mining Congress Journal Adds To Its Service By Establishing Special Department—Western Mining Man To Direct Discussion.

IT is a great pleasure to the MINING CONGRESS JOURNAL to announce the addition to its staff of Guy N. Bjorge, consulting engineer, San Francisco, Calif. While in no way relinquishing his consulting work, Mr. Bjorge will supervise the recently installed department devoted to the discussion of practical operating problems of the metal mining industry, bringing to this discussion his wide knowledge of metal mining problems and conditions. This department of the JOURNAL is comparatively new and

prospects; (2) examination and direction of exploration in operating mines, and (3) the valuation of mines. He has been employed in this capacity for such companies as the Old Dominion Company, the Arizona Commercial Mining Company, the Calumet & Hecla Mining Company, the General Development Company, the Montezuma Copper Company, the North Star Mines Company, and the Metals Exploration Company.

His experience in foreign countries include examination of mining properties in Venezuela, Cuba, Mexico, and British Columbia.

Mr. Bjorge is a member of the American Institute of Mining and Metallurgical Engineers, the Society of Economic Geologists, and the American Mining Congress. For the past two years he has been a member of the Standardization Division of the American Mining Congress, serving upon the special section of the Metal Mining Branch, giving consideration to the subject of methods of mine sampling, methods of recording underground geological data, and methods of estimation of ore reserves for low, medium and high-grade ore bodies, of which committee Philip D. Wilson, of the Calumet and Arizona Mining Company, is chairman. Early this year Mr. Wilson appointed him as chairman of a subcommittee of this section to investigate and report upon the general subject of mine sampling.

The MINING CONGRESS JOURNAL and the metal mining industry are to be congratulated upon securing the cooperation of Mr. Bjorge in establishing the Department of Practical Operating Problems for the Metal Mining Industry. This department will make its first appearance in the September issue.



Guy N. Bjorge

will have for its purpose open discussion by practical operating men of their every-day problems.

Mr. Bjorge was born in Minnesota and is a graduate of the School of Mines, University of Minnesota, from which school he graduated in 1912 with the degree of engineer of mines. His early service includes engineering work for Pickands, Mather & Company; geological reconnaissance work for oil in the district of Colon, Venezuela, South America, for the Barber Asphalt Company; geologist for the Old Dominion Company, Globe, Ariz., with which company he served first as assistant to John M. Boutwell in making a complete examination of their properties and later as chief geologist, leaving their employ in 1917 to undertake consulting mining geological and engineering work, with headquarters in San Francisco. He has in his consulting capacity specialized in (1) the examination and appraisal of

"Of the six major lead districts on which the world has relied, three have passed into a stage that presages waning supplies," says the 1924 Commerce Year Book. "Spanish production is running below its pre-war amount, and Australian output has declined owing to labor troubles as well as exhaustion of lead dumps and tailings upon which it relied in the past. The Coeur d'Alene (Idaho) district has experienced the bottoming of some of its greatest mines. Southeastern Missouri set a new high record and enlarged plants to take care of an expected further increase. The tri-State district operations were stimulated by the price of lead and the rising zinc market. World consumption of lead is notably strengthening."

DEALERS IN GOLD-SILVER ORES AND BULLION MUST TAKE OUT LICENSES

THE 46th Session of the California Legislature passed a bill which has been signed by the Governor and which became effective July 24, which, according to a statement by the State Mining Bureau, through Lloyd L. Root, provides for the regulation and control and licensing of persons, firms or corporations engaged in the business of sampling, concentrating, purchasing, or receiving for sale ores, concentrates or amalgams bearing gold and silver, gold dust, silver or gold bullion, nuggets or specimens.

This act will make it necessary for any one dealing in the above mentioned materials to take out a license together with a bond, the license fee being \$100 per year and the bond \$3,000. The banks, while exempt from paying the license fee, will not be exempted from the provisions of the Act and of the bond. Jewelers and pawnbrokers who turn in their sweepings and scrap as is and not melted will be exempted, but those dealing in ores, specimens, nuggets and melted materials will come under the provisions of the act. Others affected by this act are assayers, storekeepers, trustees, referees and others dealing in gold and silver ores, bullion, nuggets and amalgams.

An abstract of the law is as follows:

Section 1. Provides that it shall be unlawful for any person, firm, association or corporation, without first procuring a license from the state mineralogist, to engage in the business indicated in the above mentioned title. The annual license fee is \$100 and will be issued only to bona fide residents of California, and to such corporations organized under the laws of other states as are duly qualified to do business in this state. *Provided, however,* that this act is not to be construed as requiring a license for any mill, sampler, concentration or reduction plant used exclusively by any company or owner in sampling milling, reducing or concentrating ores produced by such owner.

Section 2. Provides that the application for license must be made to the state mineralogist accompanied by certain information which must be sworn to by such applicant. Licenses will be granted only after 30 days notice and by publication at least once a week for three successive weeks, at the expense of applicant, in a newspaper published in the county where such business is carried on.

Protests to the granting of licenses, and written charges for the revocation of licenses already issued, may be filed and public hearings held thereon in ac-

cordance with prescribed rules, and the state mineralogist shall have the power to reject an application or revoke any license for failure on the part of the applicant or licensee to observe this act or any law of the state relative to larceny or receiving stolen property. Application for a review or appeal to the Superior Court from any decision made by the state mineralogist is also provided for under the provisions of this section.

Section 3. Provides that each application for a license shall be accompanied by a bond to the people of the State of California in the sum of \$3,000, and conditioned that the licensee shall not violate any law applicable to said business. Said bond will be subject to execution upon any judgment recovered against a licensee as the result of his violation of any law relating to such business.

Section 4. Provides that *every* person, firm, association or corporation engaged in such business shall keep and preserve a book in which shall be entered at the time of delivery of any ores, concentrates or amalgams, bearing gold or silver, gold dust, gold or silver bullion, nuggets or specimens:

First. The name of the party on whose behalf such ores, concentrates, gold dust, gold or silver bullion, nuggets or specimens are delivered.

Second. The weight, or amount, and a short description of each lot thereof.

Third. The name and location of the mine or claim from which it shall be stated that the same has been mined or procured.

Fourth. The name of the party delivering the same.

Fifth. The date of delivery; and

Sixth. Whether the party making the delivery is a lessee, superintendent, foreman or workman in such mine.

Such record book shall be open for inspection at all times to the state mineralogist or his authorized agents, and by permit of the state mineralogist issued to any other person who claims under affidavit to have sustained a loss by theft or trespass of property subject to sale under this act.

Section 5. Provides that licensees who fail to keep records, as above provided, or who make any false entries or use fictitious names, or fail to permit the inspection of books by authorized persons, shall, upon conviction, forfeit their license and become liable to the penalties hereinafter provided.

Section 6. Provides that any person who shall make any false statement concerning any facts required in Section 4 shall be guilty of a misdemeanor.

Section 7. Provides that complaints against any licensee shall be made in writing and filed with the state mineralogist. Upon due notice to all interested parties, and after a hearing thereon, the state mineralogist may refuse to issue and shall suspend or revoke any license for any good cause shown.

Section 8. Provides that any violation of Sections 1, 4 and 5 of this act shall be punishable by a fine of not less than \$100 and not more than \$1,000, or by imprisonment for not less than 30 days or more than 6 months, or by both such fine and imprisonment.

U. S. BUREAU OF MINES APPOINTMENTS

H. H. HILL chief petroleum engineer, has been placed in charge of the Petroleum Division of the Bureau of Mines, Department of Commerce, and will have supervision of all petroleum investigations conducted by the Bureau both in the Washington office and the various field stations and offices. Mr. Hill has served as assistant chief petroleum engineer for the past two years, and previous to this service was supervisor of oil and gas operations on leased public lands and superintendent of the Petroleum Experiment Station at Bartlesville, Okla.

S. P. Kinney, assistant metallurgical chemist, with headquarters at Pittsburgh, Pa., has been designated as supervising metallurgist of the Bureau of Mines. Mr. Kinney will have technical supervision of the Bureau's ferrous metallurgical work both at the Pittsburgh Station and at the other experiment or field stations where ferrous metallurgical work is conducted. All members of the metallurgical staff of the Bureau have been instructed to bring to Mr. Kinney's attention any matters pertaining to ferrous metallurgy which in their opinion may be of interest to the Bureau of Mines. Mr. Kinney has for some time been engaged in the study of problems affecting the technology of blast-furnace practice.

C. E. Sims, electrometallurgist, has been designated as chief of the metallurgical section at the Pittsburgh, Pa., experiment station of the Bureau of Mines, and in this capacity will have technical supervision of all metallurgical work conducted at that station.

E. D. Gardner, mining and explosives engineer, will, effective August 1, serve as acting superintendent of the Southwest Experiment Station of the Bureau of Mines, Tucson, Ariz.

The Geological Survey has issued a bulletin covering experiments for getting more oil from oil-field sands. The Survey suggests that field trials be made of certain laboratory experiments.

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SILVER REVALUATION PROPOSED

(Continued from page 377)

such excessive figures as 35 and 40 percent, we are utterly unwilling to subscribe to any such procedure.

"We feel very strongly that interest rates are being used as a weapon to depress valuations from their true and proper level down to preconceived notions of what the value ought to be, thus nullifying the very work which the mining engineer is supposed to do.

"Finally, we are left at sea by the concluding paragraph of the Memorandum which may only mean that if the engineer is not satisfied with the valuation which results from the present value method, even by the use of the factors as therein set forth, he may then use some other undefined or undisclosed method that will give such a value as he desires to show."

UNIVERSAL APPLICATION PROPOSED

The Unit's memorandum to which silver producers made the foregoing reply, states at the outset that the sole recommendation made by the income tax unit with respect to the proposed revaluation of silver mines, is that silver mining properties should be valued in a manner consistent with the valuation methods developed and in use by the metals valuation section for the valuation of other types of metal mines; that the income tax unit believes the principles and methods of valuation outlined in the statement are *universally applicable*; and that if the proposed revaluation of silver mines is finally approved, *it is understood that these principles will apply.*

Inasmuch as valuation methods in use by the income tax unit have not heretofore had universal application to all classes of metals mines, the implication that the principles on which approval of the Commissioner is now sought by the metals valuation section will be applied universally, is most significant.

In this connection, it is *apropos* to refer to a statement made at the Milwaukee convention of the American Mining Congress in 1923 by Paul Armitage, Chairman of the Mining Congress general tax committee. Mr. Armitage said: "We start with the battle won so far as the recognition of the depletion allowance, its justice and base are concerned. But the industry is liable to lose the fruits of this victory in the settlement of the question of the *rate of depletion*."

FIXED RULES NOT WARRANTED

"The law itself requires that the mode of fixing depletion allowances shall be flexible and adapted to each case. While not specifying the mode, the law requires that operating mines be granted a

reasonable allowance for depletion and depreciation of improvements, according to the peculiar conditions in each case." The qualifying words (1) 'reasonable' and (2) 'according to the peculiar conditions in each case' express in pell-mell English the intention of Congress that the method of allowing depletion and depreciation to taxpayers should not be fixed or standardized—but elastic. These same phrases have been repeated in each of the income tax statutes, thus establishing a settled legislative intention."

Thus, it has been thought that the law precluded the application of fixed rules and formulae to all cases alike, regardless of the peculiar conditions existing in each case; but the present blanket revaluation proposal, which embodies a method of valuation that impliedly will have universal application if it meets with the Commissioner's approval, is based upon a different interpretation of the law from that which has been generally accepted in the past.

SILVER ASSOCIATION INTERVENES

Appearing on behalf of the silver mining industry, W. Mont Ferry, of Salt Lake City, President of the American Silver Producers' Association, opened the case for the taxpayers by presenting a brief on behalf of the membership of the Association. Mr. Ferry contended that the reopening of valuations once settled in good faith, in the absence of fraud, concealment, and the like, is without warrant of law and is contrary to Treasury regulations under the revenue acts of 1918, 1921, and 1924.

He said that there was no charge of fraud or concealment involved; that the facts upon which the original valuations were based are the same facts upon which the metals valuation section proposes to base its revaluations, and therefore there appears to be no charge of gross error as to facts; that the proposed revaluations are the result of new and different interpretations of the facts originally furnished to the income tax unit by the taxpayers, and upon which the tax liability of the several taxpayers was determined and paid.

NO FRAUD OR CONCEALMENT

In summing up his argument on behalf of the silver producers, Mr. Ferry said: "The proposed revaluation finds no support from any source—law, regulations, simple justice or common sense. Fraud, misrepresentation or concealment were not committed and are not charged. So-called gross errors of fact, the only remaining possible basis on which revaluation might be justified, prove to be only differences of opinion and judgment. They are in no sense errors of 'fact determinable on the basic date' and are entitled to be called errors only be-

cause present ideas of engineers lead to different figures.

"Such actual individual errors of facts or computation as may have slipped into the existing valuations may undoubtedly be corrected and adjusted without difficulty and without any need whatsoever for general revaluations.

"Revaluation if approved as proposed would work grave injustice on an entire industry. And if revaluation were once started it would never stop but would lead to interminable changes and abuses, defeating any policy of stability, finality and equity and producing results no less intolerable than absurd. The case for revaluation has no standing and should be immediately and forever dismissed."

STOCKHOLDERS INTERESTED AFFECTED

The American Mining Congress joined with the American Silver Producers' Association in protesting against the proposed revaluation plan. In the statement presented on behalf of the Mining Congress, it was contended that the investments of thousands of individual stockholders of the silver mining companies are being jeopardized by the proposed action; that the individual tax settlements of these stockholders would be reopened if revaluation is ordered and the revenue bureau is consistent in its policy; that revaluation will affect settlements made under Federal and State estate tax laws and State income tax laws; that revaluation will result in financial reverses and readjustments in silver mining, increase the difficulty of securing needed capital, and prevent the making of commitments respecting plant additions, expansion programs, and mine development.

At the conclusion of the hearings, the silver taxpayers were given ten days within which to file a final brief summarizing their case and answering some of the technical questions raised by the memorandum of the metals valuation section. The engineers of that section will be given ten days within which to make reply to the briefs, arguments, and evidence presented by the producers. Commissioner Blair promised an early decision.

Seven million tons of oil shale in a continuous seam are estimated to exist in the Wakkerstroom area of the Transvaal, South Africa. This is based on a report of the oil-fuel committee appointed by the Union government, which, since 1922, has been investigating the question of liquid fuels in South Africa. The committee regards the competition to be met from products of well oil as an important factor in the development of an oil shale industry, and the government has been requested to offer a bounty on the production of fuels from oil shale.

THE COLORADO OIL SHALE INDUSTRY

Oil Shale Comprises One Of Colorado's Greatest Undeveloped Sources Of Wealth—Its Development Is A Big Problem Requiring Large Financial And Highest Executive Ability—State And National Government Cooperating In Experimental Work

THE Colorado oil shales form a portion of the region commonly known as the western slope and are a part of the great western oil shale field which extends into Utah and Wyoming. The Denver and Rio Grande Western Railroad traverses the section, with the Battlement Mesa to the south and De Beque, Grand Valley, and Rifle sections to the north. Throughout this entire region the shales lie in virtually horizontal strata, exposed, and easily visible from the car windows or roadways. The varied colors of the strata and their uniformly horizontal position remind one of piles of books on a shelf; hence the common name of Book Cliffs.

To deal properly with the amount of oil shale in Colorado one must enter the realm of astronomical computation. Thus the total length of oil shale escarpments about Grand Valley and De Beque reaches 269 miles. The area of oil shale land is approximately 2,000 square miles. The potential content expressed in barrels is 79,625,000,000; the recoverable amount is at least 50,000,000,000 barrels. This is to be compared with the estimated recovery of only 9,000,000,000 barrels from all the known remaining oil pools in the entire United States. Thus the available supply of oil from shale in Colorado is more than five times that from all the combined well oil pools remaining in the country.

The enormous extent of the outcrops of oil shale in Colorado and the vast number of places at which adits may be run and the shale mined can be appreciated by considering two salient facts. First, the escarpments of oil shale, or outcroppings, on the banks of Parachute Creek and its tributaries, north of Grand Valley, reach a total length of 69 miles. Second, within a radius of 35 miles, north and west of De Beque, the total length of such escarpments reaches 200 miles; to these should be added the outcrops on Battlement Mesa, not yet determined. Such a mining face open to development and exploitation

By VICTOR C. ALDERSON*

has never been known before and opens a field of enterprise of vast importance, not only to Colorado but to the entire country as well.

RELATIVE VALUE OF COLORADO OIL SHALES

Dean E. Winchester has studied carefully the value of Colorado oil shales as compared with the oil shales in other states and expresses himself as follows: "The deposits of northwestern Colorado, Green River formation, in average per acre richness exceed any of the other deposits so far known in the United States and probably in the world. More is known regarding the distribution, richness, and general character of the oil shales of the Rocky Mountain region than any other region, and sufficient data are available in certain of the other more promising areas to make it possible to estimate roughly the probable amount of oil that may be taken from an acre of ground. Preliminary computations have been made for six of the more important states as shown in Table I. Inasmuch as the average yield of oil per acre for Colorado is the greatest, this is taken as 100 percent and the average oil-yielding capacities of shale lands in the states are compared with the average for Colorado.

"Locally shale deposits may, and doubtless do, have greater relative importance than is indicated by figures. If only the southern half of the area of oil shale land in northwestern Colorado is considered, the average per acre richness will be greatly increased, for the shales along the northern outcrop of that area are neither as rich nor as thick as those of the Grand Valley-De Beque region to the south. The relations shown in the table are based on richness and thickness alone and do not completely

represent the relative worth of shales of the different states for development purposes. In order to evacuate properly and to compare the various deposits, one must also take into consideration the peculiarities of the area which influence the cost of mining and marketing the products, relations to transportation, water, etc., as well as the quantity of oil which is available from the shale. The shales in parts of Indiana and Kentucky, for example, which give an average oil yield of less than a half barrel per ton as compared to more than a barrel per ton for shales of the Grand Valley-De Beque region of Colorado, are in a region where relatively cheap open-pit mining methods may be used in winning the shale, while in the Colorado area underground methods will be necessary. However, when all the influencing factors are taken into consideration the Colorado oil shale lands must be placed at the head of the list of desirable properties for development for their oil shales."

William C. Russell has made an extensive study of the oil shales of northwestern Colorado. His results on 12 separate strata, one above the other, on upper Parachute Creek in the Grand Valley region are given in Table II.

This has been expressed in the form of an ideal cross-section, showing the approximate relative positions and values in potential oil content of these 12 beds of commercial oil shale as classified in accordance with the schedule of the United States Geological Survey. Bed No. 1, of 49 feet thickness, is notable, as within this total of 49 feet, which as a whole yields 35.5 gallons to the ton, is an 8.5-foot stratum—locally known as "mahogany shale"—which yields 60 gallons to the ton, or 25,750 barrels to the acre. Also, if 23.5 feet of this 49 feet be considered to include the mahogany shale,

the yield is 45.5 gallons to the ton, or 53,400 barrels to the acre. For economic value this showing can scarcely be surpassed in any other known oil shale deposit.

The estimates, given in Table III, as to oil production



Apparatus Used in Demonstrating to Government Officials the Necessity of Oil Shale Investigations

*President, Colorado School of Mines.

TABLE I

Approximate Relative Value (richness and thickness) of Oil Shales of Six States		
State	Relation involved	Approx. area
Percent	Acres	
Colorado	100	900,000
Kentucky	27	609,686
Utah	20	2,700,000
Indiana	20	320,000
Wyoming	9	500,000
Nevada	8	1,000

TABLE II

Bed No.	Thickness	Richness	Total yield
	Feet	Gal. per ton	per acre
1	49.0	35.5	86,700
2	8.0	24.0	9,850
3	10.5	20.0	10,500
4	9.0	20.0	8,850
5	18.5	18.0	12,350
6	11.5	18.0	10,350
7	5.5	25.0	6,875
8	15.5	16.5	12,800
9	10.5	16.5	8,625
10	8.5	16.0	6,800
11	6.5	18.0	5,800
12	6.0	18.5	5,550
Total	154.0		185,050

TABLE III

A. Mining and treating shale from the richest part of the section:	
Thickness mined (average 58 gallons per ton).....	feet..... 3.5
Oil content per acre.....	barrels..... 25,750
Production per acre based upon mining 90 percent of shale in ground.....	barrels..... 22,895
Oil content of shale not mined:	
Beds 6 feet or more thick yielding 20 gallons or more.....	barrels..... 100,000
Beds 6 feet or more thick yielding 15 gallons or more.....	barrels..... 162,000
B. Mining and treating shale from main rich bed:	
Thickness mined (average 45.5 gallons per ton).....	feet..... 23.5
Oil content per acre.....	barrels..... 53,425
Production per acre based upon recovery of 70 percent of shale in ground.....	barrels..... 37,397
Oil content of shale not mined:	
Beds 6 feet or more thick yielding 20 gallons or more.....	barrels..... 73,000
Beds 6 feet or more thick yielding 15 gallons or more.....	barrels..... 134,300
C. Mining and treating shale from 49 feet thickness:	
Thickness mined (average 35.5 gallons per ton).....	feet..... 49
Oil content per acre.....	barrels..... 63,175
Production per acre based upon recovery of 65 percent of shale in ground.....	barrels..... 41,063
Oil content of shale not mined:	
Beds 6 feet or more thick yielding 20 gallons or more.....	barrels..... 40,000
Beds 6 feet or more thick yielding 15 gallons or more.....	barrels..... 101,000

are based upon complete sections and tests of the oil-yielding strata in Parachute Creek, Grand Valley, Colo., by A. S. Crossfield, petroleum chemist.

TABLE FOR DETERMINATIONS

Table IV was prepared to illustrate the regulations and to aid in the rapid determination of commercial oil shale. The top row indicates the thickness of the deposit in feet; the left-hand column, the yield in gallons per ton; the figures in the bottom of each square the yield per acre; and the upper figures the maximum depth permissible. That is, a 4-foot bed, yielding 35 gallons to the ton, has a capacity of 7,000 barrels of oil to the acre and, if not deeper than 2,750 feet from the surface, would be classified as oil shale placer, subject to entry. Also, a 2-foot bed at the surface, yielding 15 gallons to the ton and 1,500 barrels to the acre foot, would also be classified as oil shale land.

ESTIMATING COSTS

Following is a list of the most important points which must be covered preliminary to estimating mining costs:

1. Geographic location of shale bed with particular reference to altitude, climatic conditions, base of supplies, and labor centers.
2. Thickness of bed to be mined.
3. Character of shale, with reference to toughness or brittleness.
4. Thickness of overburden (in considering open-cut work).
5. Character of roof (in considering underground work).
6. Presence or absence of waste within the stratum to be mined.

7. Dip or inclination of the stratum.
8. Elevation of bed above valley floor and, hence, its position with reference to water level.

9. The water problem.
10. Character of entry—tunnel, slope, or shaft.

11. Cost of labor, power, timber, and general mine supplies.

12. Daily tonnage to be mined.

13. Latitude as to capital investment in opening the property and the installation of labor-saving machinery.

14. Proportion of overhead which the mine must stand.

LARGE COMPANIES INTERESTED

The Pacific and Associated Oil companies of California are reported to be making efforts to secure a large acreage in Colorado. The company has engineers on the ground

and is investigating the situation.

The Union Oil Company of California has expended \$800,000 and has secured 18,000 acres in the Parachute district north of Grand Valley. For the past five years the company has pursued a consistent policy of doing field work to determine the value of the land and to carry it to patent, as well as laboratory experimental work on the shale itself. The policy of the company appears to be to acquire an extensive reserve of oil shale as well as a knowledge of the industry, so that it may continue to be an oil producer for centuries to come.

The Ventura-Colorado Oil Company, a subsidiary of the Ventura Consolidated Oil Company of California, has acquired title to 10,180 acres of oil shale land, of which 9,600 acres have been patented; also 1,100 acres of ranch land, part of which is shale bearing. The ranch land was purchased chiefly for the water rights and plant sites. The entire tract has been securely fenced and comprises one complete unit. The shale beds have been prospected by diamond drilling at a cost of approximately \$25,000. Fifteen strata of oil shale were discovered, from which the lowest analysis gave 34 gallons to the ton and the highest 71. One bed of 19 feet of shale without fractures, breaks, or seams—all minable—gave 62 gallons to the ton. W. S. Skinner, the resident engineer, estimates that a 5,000-ton plant on the property would cost approximately \$3,000,000, but this cost

TABLE IV

	1 foot	2 feet	3 feet	4 feet	5 feet	6 feet
Gallons		S	375	750	1125	1500
15	750	1500	2250	3000	3750	4500
		S 18 ^{1/2} 1000	250	750	1250	1750
20		1000	2000	3000	4000	5000
		S 14 ^{1/2} 1500	500	1125	1750	2375
25	1250	2500	3750	5000	6250	7500
		S 1500	750	1500	2250	3000
30	1500	3000	4500	6000	7500	9000
		125	1000	1875	2750	3675
35	1750	3500	5250	7000	8750	10500
		250	1250	2250	3250	4250
40	2000	4000	6000	8000	10000	12000
		375	1500	2625	3750	4875
45	2250	4500	6750	9000	11250	13500
		500	1750	3000	4250	5000
50	2500	5000	7500	10000	12500	15000
		625	2000	3375	4750	
55	2750	5500	8250	11000	13750	16500
		750	2250	3750	5000	
60	3000	6000	9000	12000	15000	18000

would include an 18-mile railroad, complete camp with all necessary houses, power plant, and water development. The second 5,000-ton unit could be erected for \$100,000. The company has thus far expended approximately \$400,000. It is believed that the first oil shale plants to be erected should not attempt to produce by-products but should limit their products to gasoline and fuel oil.

In May, 1924, the Continental Oil Company entered into an agreement with S. G. McMullin, of Grand Valley, and associates, owning the Standard Shale Products Company, which in turn owns 11,000 acres of shale located on Kimball Top near De Beque, whereby they became interested in the company to the extent of controlling interest. A field party is now at work on the property. The Associated Oil Company of California has also acquired extensive holdings in the De Beque field.

ECONOMIC ASPECT

A few important facts are to be kept constantly in mind when considering oil shale on a large commercial scale. It is not a poor man's game, but a rich man's business. Operations must be conducted on a large scale. A million dollars or so must be spent before a single dollar is returned. A thousand tons of shale must be mined, crushed, retorted, and refined daily. The profit will depend on a small margin per ton, magnified by a large tonnage. That small margin of profit may come from any one of several economies, e.g., cheapness of mining; convenient arrangement of plant buildings; simplicity of operation, dumping ground, and similar factors. The success of the enterprise may also depend upon the special value of one product like a superior product in lubricating oil, water white gasoline, a good grade of wax or ichthyol—the skin specific. The use of the fixed carbon in the spent shale may also be a source of profit in making producer gas. If there is a local supply of limestone, there is the possibility of using the residue in the manufacture of bricks, in which case an excess of gas could be profitably used as fuel.

In spite of advances made, the critics of oil shale are still busy. First, they

decried it as unable ever to compete with well oil because well oil is manufactured by nature at no cost. Such was said of artificial ice when it was a laboratory curiosity, yet today artificial ice is manufactured even in the tropics and has a world-wide use, while natural ice is a curiosity. In the early days of the beet industry it was argued that Colorado could not raise sugar beets and compete with cane sugar from Cuba, yet today the beet sugar industry of Colorado is worth many million dollars to the state. The critics also see nothing in oil shale either for us or for our children; perhaps it would come into service for our grand-

prop has been taken away by the work of R. M. Catlin, who is now operating his plant at Elko, Nev., treating a hundred tons of oil shale a day and selling the products on the market. In a short time the critics will wish they could blot out the memory of their short-sighted vision, because the inevitable march of progress will surely demonstrate the narrowness of their view and their failure to recognize industrial progress. The day when oil shale will be in active commercial demand is in the near future. Just when that day can be marked on the calendar is debatable. That oil from shale can be produced and put on the market now at a profit is well assured by the success of the Catlin plant. However, the great advance and the general acceptance of the fact depends upon the price of well oil. This price is the result of many factors in the petroleum industry. To arrive at a just conclusion, several factors must be considered, e.g., statistics show that during the past 14 years production and consumption of petroleum have increased with

children. The best informed oil men today are recognizing and admitting guardedly, to be sure, that the supply of well oil has passed its peak and that in a very few years a fresh source of oil must be sought. Thomas A. O'Donnell, president of the American Petroleum Institute, in his presidential address at Fort Worth, Tex., said:

"When the time comes that the American people have exhausted their cheap petroleum supplies, if that time ever comes, and no substitutes are found as cheap as we can produce our gasoline today, then we will go into the activity of producing substitutes, and we will go into the Rocky Mountain range, which contains more petroleum for use of the people when wanted than all the petroleum we have yet produced, and more than some of our scientific gentlemen have given us credit for having to produce."

Did he refer to oil shale? The criticism, however, that seemed to give the critics most satisfaction was the admitted fact that there was no plant in commercial operation. However, this last

great rapidity, but that domestic production has not increased with the demand and the Mexican supply has been used to meet this shortage; unless new gushers are tapped and new pools discovered, similar to those in the Los Angeles region—a condition possible but not probable—the price of petroleum, in spite of the amount now in storage, will advance rapidly. When it reaches an average price of \$2.50 in the Mid-Continental field—and possibly \$2—pronounced activity in the production of oil from shale will result.

OFFICIAL RECOGNITION BY U. S. GOVERNMENT

Official recognition of the importance of oil shale has come with the passage by Congress of a bill appropriating \$90,000 for the erection of an experimental plant on the Naval Oil Shale Reserve in western Colorado. This reserve in Colorado comprises 63,000 acres. The need of the Navy for a dependable supply of oil is not satisfied by a reserve oil pool that may be drawn off by adjacent wells or destroyed by dynamite. Oil to be



U. S. Bureau of Mines Photo
Typical Oil Shale Formation Near De Beque, Colorado—Darker and More Resistant
Beds Are Richer Shales

manufactured from beds of shale in the interior of the country, far removed from a foreign enemy, that could not be dynamited nor destroyed seemed a far better source of supply than natural oil pools. For this reason the Navy Department became deeply interested in oil shale. To convince Congress and to get an appropriation to develop the Naval reserve and to determine upon a process suitable to the deposit in reserve was a more difficult problem. To this Senator Lawrence C. Phipps lent his best efforts. At his invitation the demonstration apparatus of the Colorado School of Mines was taken to Washington and set up in the auditorium of the Interior Building. Here an ocular demonstration was given to official Washington—an object lesson as new and unconventional as it was conclusive. Before their very eyes the raw shale was "cooked," the crude oil, the gas, gasoline, and the ammonium sulphate were all produced and the process explained. This, together with a conference attended by Secretaries Wilbur, Work, and Hoover, convinced Washington of the value and importance of developing oil shale.

RECOGNITION BY THE STATE OF COLORADO

Through a cooperative plan between the United States Bureau of Mines and the State of Colorado experimental work has been in progress at Boulder, where an oil shale laboratory has been equipped. The researches have been of a fundamental technical character and the results issued as United States Bureau of Mines publications. At the Colorado School of Mines oil shale experimental work has been in progress since 1917. The school quarterlies have frequently treated of the subject. An oil shale laboratory has been equipped not only for experimental work but also for instruction purposes. The school has organized a four-year petroleum engineering curriculum with an engineering degree—the only one in the United States—within which is included courses in the technique of oil shale. The school thus recognizes not only the technical and economic features of the subject but also the necessity of a personnel to undertake the actual work. Hitherto, the technical men who have given attention to oil shale have been mining engineers, chemists, or others from allied fields who have studied the subject by themselves. In the future, however, men must be trained for oil shale work as a specialty. The need is recognized by the Colorado School of Mines and is being provided for.

The problems facing the industry may be divided into three main

groups: Technical, economic, and financial. The technical problems begin with the mining, transporting, and breaking. These do not present any serious obstacles as they have already been solved in other classes of mining and the principles involved are well understood. It should be borne in mind that the total production of well oil is not an infallible may increase yet this is the result of may increase yet this is the result of large quantities of heavy oil unsuited to the production of gasoline. The output of light, or gasoline producing, oil is steadily declining even though the total production of all oil is upward. The problems of retorting and refining are more serious. They involve a thorough knowledge of organic chemistry, high temperature work, and a mastery of what is termed "works chemistry," as distinguished from theoretical laboratory determinations. That is, there is a wide difference between testing and observation on an ounce of oil shale in a test tube and a thousand tons in a bank of retorts. The aim of American chemists is to secure a type of retort that will surpass the Scotch retort in first cost, rapidity of action, and daily throughput. The daily production of a single Scotch retort never exceeds five tons and approximates only three or four. Such a retort would not be justified in Colorado. What is needed to meet the demand which is surely to come is a retort that will give 50 or 100 tons a day, at no greater first cost, automatic and durable in action, and virtually foolproof in operation. This has been the underlying

purpose of American experimenters. It is not likely that, in the near future, there will be a single "best" American retort, but that there will be a number, each with some special advantage of design and operation that will work at a financial profit on certain shale beds. In course of time standard forms of design and practice will no doubt be developed, as has been the case of the telephone, the bicycle, the auto, and now the radio. The economic problems are of wider range and are under less control. They involve the demand for gasoline, fuel oil, lubrication oils, ammonium sulphate, wax, and any other of the numerous possible products from crude oil, whether the crude be well oil or shale oil. This demand will be determined by the needs of industry. In a competitive sense the price of crude petroleum at the well is all important. Crude shale oil must be manufactured at a cost below this price in order to hold its own in the general market. In the minds of those best able to judge it is possible at the present time to equip oil shale plants on a large scale and to produce crude shale oil for less than the price that equivalent well oil brings in the Mid-Continent field. To be explicit, it seems that \$2.50 a barrel is a conservative figure to name, at which price manufactured crude shale oil can compete successfully. All other problems sink into insignificance in comparison with the financial. Given ample funds a successful oil shale plant can now be installed in Colorado and placed upon a profitable basis. However, cash must be supplied for the purchase of land, opening the mine, installation of machinery, the determination of the proper retort, a successful refining process, the organization of a selling force, and the marketing of the products, all before a single dollar is earned—surely a large undertaking—yet it can be done and surely will be done because the condition of the oil industry will soon demand it.

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U. S. Bureau of Mines Photo
Set Up of Assay Retorts, Boulder Oil Shale Laboratory, U. S. Bureau of Mines

STANDARDIZATION MOVEMENT SHOWS PROGRESS

Year Book Engineering Standards Committee Shows Progress
In Saving Through National Standardization

THE National Standardization Movement is being taken up by the major industries all over the country and is showing promise of savings aggregating many millions of dollars, as shown by the 1925 Yearbook of the American Engineering Standards Committee.

Officially participating in the work of this committee, which acts as a national clearing house for engineering and industrial standardization and is the means whereby nation-wide approval and acceptance can be secured for suitable standards in industry, are 245 national trade, technical, industrial and governmental organizations.

The committee's yearbook shows that 68 standards have already been approved and work on about 100 other projects is actively under way. An extremely wide range of activities is represented in the technical projects, which include 32 in civil engineering and building trades, 26 in mechanical engineering, 17 in electrical, 4 in automotive, 9 in transportation, 1 in shipbuilding, 9 ferrous metallurgy, 14 nonferrous metallurgy, 12 chemical, 2 textile, 16 mining, 5 wood, 1 pulp and paper, 12 miscellaneous.

Of special interest is the development of standardization in the mining field, where little has been done until recently. Among the mining projects of the committee are codes for rock dusting, mine illumination, ventilation, use of explosives, and underground transportation. Much of this work is done to serve as a guide in pending legislation.

That more than 160 of the national organizations participating in the work are trade associations is significant of the increasing role which standardization is playing in the activities of such associations. In this connection the recent decision of the United States Supreme Court in regard to the trade associations is important. The court stated that, in the cases before it, no exception had been taken to the standardization activities of the trade associations and the court classes standardization among those cooperative activities of associations "which are admittedly beneficial to the industry and to consumers."

Many industrial concerns are coming to have some definite organization for their standardization work—a development that has proceeded much further in Germany than is yet the case in this country. An important step in this direction is the direct affiliation of 300 industrial companies with the committee.

The Federal Government is cooperating more and more closely with the committee. One or more of the arms of the

Government are operating in almost every project. The Bureau of Standards and the Federal Specifications Board jointly maintain a liaison office with the committee. During the past year the committee circulated more than 100 of the specifications of the board for criticism in order to determine their acceptability in industry before official adoption by the Government.

The committee has actively assisted the Department of Commerce in the preparation of the "Dictionary of Specifications" which is soon to be published and which will contain a classified index of some 25,000 specifications, covering about 600 commodities. At the request of the Department, the committee is arranging to act as general distributing agent for those of the specifications that are issued by nongovernmental national associations, so as to make such specifications conveniently available at small cost to buyers and suppliers of commodities in all lines of trade.

Extremely close relations are maintained between Mr. Hoover's Division of Simplified Practice and the American Engineering Standards Committee. Under the procedures of the Division, 26 simplifications have been carried through, 10 others are in the final stages, and 45 additional surveys are under way. Problems in the nature of simplification which arise in the activities of either organization are referred to the division and problems involving technical considerations are referred to the Standards Committee.

National standardizing bodies have been organized in all important industrial countries. There are now 19 such bodies, with all of which the committee is in active touch.

Heretofore there has been no very active development of standardization activities in Latin America, and hence the Pan American Conference on Standardization, which opened in Lima, Peru, on December 23, was a notable event. Thirteen American states were officially represented, the retiring chairman of the A. E. S. C., A. W. Whitney acting as chairman of the official American delegation.

A special feature of the service of the American Engineering Standards Committee is to supply American manufacturers with foreign standards, specifications, recognized trade designations, etc., thereby permitting bids by cable without misunderstanding or loss of time.

In order to keep industrial executives in touch with the movement, so far carried on largely by technical men, the

following advisory committee was recently formed at a conference of first-line industrial executives held in New York recently:

J. A. Farrell, president, United States Steel Corporation.

George B. Cortelyou, president, Consolidated Gas Company of New York.

J. W. Lieb, vice-president, New York Edison Company.

L. F. Loree, president, The Delaware & Hudson Company.

Gerard Swope, president, General Electric Company.

C. E. Skinner, of the Westinghouse Electric & Manufacturing Company, is chairman and C. R. Harte, of the Connecticut Company, is vice-chairman of the American Engineering Standards Committee.

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THE NATION'S VIEWPOINT



SECRETARY MELLON'S announcement that the unexpectedly large surplus at the end of the fiscal year of some \$250,000,000 is not to be used for reducing taxes is meeting with the approval of the press. *The New York Times*, while thoroughly agreeing with Mr. Mellon's policy, also admits that there will be many people in Congress and out of it who will not be convinced that the administration policy is the wisest course. They further state:

"It will be applied almost in its entirety to the redemption of the public debt. This, it might be said, is an indirect way of lowering taxes. If the interest charges which the government has to meet are steadily cut, the amount of revenue required, and therefore taxation laid, will correspondingly be less. But this is for future realization. The present point is that this year's surplus is not to be held over to be added to the estimated surplus of 1926, in order to create a fund of more than \$500,000,000 to be used for the purpose of a reduction in Federal taxes. President Coolidge adds the comment that a program of only moderate tax reduction can be expected from the next session of Congress, since the needs of the Treasury must be kept in mind and the possibility not forgotten that its income may be brought lower by bad times.

"In all this debate, it must be remembered that there is a difference between mere tax reduction and scientific tax reform. The point was well made in a recent address before the South Carolina Bankers' Association by David E. Finley, of the Treasury Department. He dwelt on the fact that our present system of Federal taxation is haphazard. We blundered into it under the pressure of the war. Since then it has been variously and slightly modified, but it still remains, in essentials, a war scheme of taxation. What is the result?

"It is true that the rates have

been reduced and the burden of taxation has been greatly lightened. The Revenue Act of 1924 incorporated in the tax system many desirable administrative changes, such as the establishment of a Board of Tax Appeals. Some improvement may be expected from these changes. It will be possible to expedite the settlement of contested cases and thereby to relieve the taxpayer of the fear of unknown future assessments. But these changes, while excellent in themselves, do not go to the heart of tax

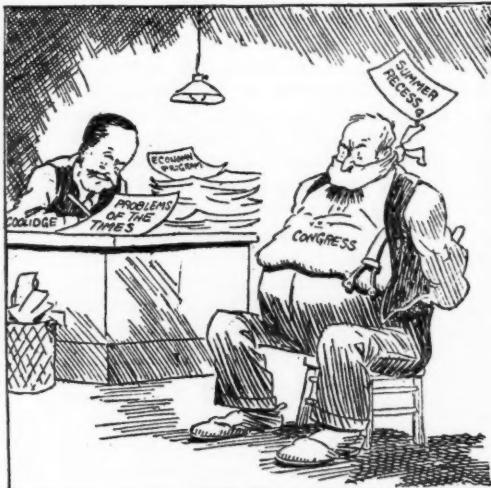
and soberness. They represent no merely partisan attitude. The questions involved are not of the right or power of the Government to lay taxes as they have been laid, but of expediency.

"The old prejudices persist and reassert themselves to-day. They have to be met by the cold test of fact. This is insisted upon by Professor Adams, of Yale, an expert on taxation who has well served the Treasury Department. A part of his statement of the case may be cited:

"The reason or justification for cutting the upper surtaxes is not to reduce the taxes of the few rich men who happen to be caught. The justification is to get a tax that can be enforced; to reduce the discrepancy between the taxation of corporations and the taxation of individuals; to give back to certain lines of business whose normal supply of credit comes from wealthy individuals their normal and natural investment market; and, most of all, to give to the income tax at this critical period a task which it can creditably perform."

"Only by such statements and reiterations of elementary truth about taxation can we hope to clear away current misconceptions and the common mistakes of lawmakers. There is no doubt that in this business the Coolidge Administration is on the right track. No other part of its policy more completely commands the confidence and support of the country. The chief political question in the premises is whether the Democrats in Congress will elect once more to run their heads against a stone wall."

Congress and the President seem to be in accord concerning the inadvisability of opening up the tariff question in the coming session of the 69th Congress. William R. Green, of Iowa, chairman of the House Ways and Means Committee, in a recent statement definitely aligned himself with the President's attitude, as did Senator Reed Smoot, chairman of the Senate Finance Committee. The



Now To Get Some Work Done

reform. They fail entirely to take into account the defects of a system which seeks to build a fence around wealth in the form of high surtaxes, and at the same time provides an easy means of escape through investment in tax-exempt securities. * * * Tax reform does not mean merely a reduction in rates. It means revising the whole tax system in such a way that it will produce the revenue required for the Government's need over a long period of years, without having a detrimental effect on the normal, healthy development of the country.'

"These will seem hard sayings to the unthinking in Congress and out of it. But they are words of truth

August, 1925

THE MINING CONGRESS JOURNAL

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Shadows of Coming Events



Spoiling the Party

Washington Post takes the attitude that with the President, Chairman Green and Chairman Smoot agreeing, it ought to be a sufficient warning to those who are willing to stabilize Europe at the expense of the United States. They further point out:

"Chairman Green recently returned from an extended tour of Europe, during which he carefully studied economic conditions in the countries he visited, and with particular reference to tax and tariff questions. He is more firmly convinced now than ever before that it would be disastrous to the people of the United States for Congress to make any change looking to a reduction in rates of duty. His observations abroad have shown him that if tariff concessions are given, American producers will be confronted with an influx of products from low cost-producing countries.

"This might aid foreign debtors to liquidate their war debt—provided they applied the American dollars thus gathered to that purpose—but while that was being accomplished the President and his fellow protectionists see quite well that domestic industries would be crippled, men thrown out of work and wages generally reduced. If the United States should heed the demand of foreign statesmen that the tariff of this country be reduced so that European nations may pay their debts, the American skilled laborer would be

the first to suffer. Reduction in earning power brings with it reduction in consumption; that means falling prices, and the class that would be hit the hardest in this respect would be American farmers. Chairman Green is wise in letting the people of this country, and of Europe as well, know unmistakably that such a mistake will not be made by those now in charge of this government.

"He reaffirms what has so often been emphasized before, that balances between nations 'are not necessarily settled on the basis of the balance of trade between them alone,' but that a nation's general trade throughout the world must be taken into consideration in determining its ability to pay its debts. Mr. Green finds that the present tariff has worked well and has not unduly restricted buying or selling, as is shown by the fact that American exports and imports are valued at more than twice what they were before the war, and in quantity largely exceed that period. This administration has demonstrated that it has a very definite way of letting the people know its views on public questions. There can be no doubt of its attitude on the tariff, and the vast majority of voters who put it into power will approve its decision."

Along this same line the *Wall Street Journal* believes that President Coolidge has distinguished himself among

Presidents for the practical application of the truths he believes, and particularly his position in regard to paying debts with exports. The editorial follows:

"When history comes to get itself written it will not record President Coolidge as the author of benevolent but inapplicable generalities. It will distinguish him among other Presidents for the practical application of the truths he believes. The modest suggestion at Brussels that America should reduce her tariff in order to stimulate German exports strikes him in all its absurdity. He is reported as saying that this is another way of asking the American people to pay the German reparations.

And that is exactly what it is, leaving all questions of free trade and protection aside. That we are to shut down our steel mills and coal mines and pay out of what we earn, in other directions in which Germany does not compete, for German steel and German coal is silly. It is true that international debts, whether owing by France to us or by Germany to the Allies, must be paid out of a visible or invisible favorable trade balance.

"But the world's trade operates in no such direct way as that suggested at Brussels, although British exports to the United States have actually increased. Great Britain is paying her debt with, among other things, rubber, which we do not produce. She is exporting to India, Australia, South

America and Africa, and speaks of her balance of trade as the balance on the whole of the business she does, not the balance as between herself and the United States.

"In the inflation of the mark, especially in 1923, Germany deliberately destroyed her own working capital. She overprotected the farmers and the industrialists and she cruelly robbed the depositors in the savings banks, the holders of life insurance, the holders of mortgages for investment, the holders of her own internal bonds and, indeed, every thrifty and conservative element in Germany. She must now find working capital to utilize her excellent industrial machinery. To do so she must re-establish her international credit by strict compliance with the Dawes Plan.

"She can do so. She can export to other countries than the United States, making the reparations settlements as they come due, and there is no danger that she will thereby destroy the trade of other countries. Before the war Germany was a powerful competitor with all the other great exporting countries. She was a much more powerful competitor than she is likely to be again in any brief period of years. The other countries were able to keep their end up and meet their obligations. They may not have liked the American tariff in the past, but they adjusted their business to its requirements and they can do so again.

"As Mr. Coolidge clearly sees, the debtor nations will either send us directly what we cannot produce ourselves, or produce to advantage, or export to countries who can in turn serve us in that way."

Francis H. Sisson, Vice-President of the Guaranty Trust Company, in a recent article "The Wonder in the Rule of Gold" in the *American Bankers' Association Journal*, points out that although admittedly gold is not a perfect medium because its value changes, it, however, remains the most satisfactory standard in the world. Mr. Sisson gives the following interesting information concerning our monetary system:

"Nearly all the metals have at times been made use of as money. Early Chinese currency was of copper or iron. The ancient Spartans employed iron and the ancient Romans copper. The first Hebrew coins were of copper. Lead has been used occa-



N. Y. Evening Post
While the Sun Shines

sionally, and at one time tin was employed by the British kings. Nickel and aluminum are also employed.

"The two precious metals, however, silver and gold, hold a far more prominent place as money than any others. This is because these metals conform far more closely to those requirements which are deemed essential for this purpose, as they possess to a greater degree than any other substance the qualities of usefulness, ready transferability, a high value in proportion to mass or weight, indestructibility, while there are reasonable limits to their supply. They can also be readily divided without loss of value and, if need be, may be re-united.

"Gold and silver alone, it has aptly been observed, are of small volume, of equal goodness, easy of transport, divisible without loss, easily guarded, beautiful and brilliant, and durable almost to eternity.

"In fact, gold has long been steadily advancing to its present position of preeminence as almost the sole satisfactory basic unit of money. During the middle ages, it is true down to the eighteenth century, silver was the chief money standard, but gold came into general use in the eighteenth century.

"The gold standard was legally established by England in 1816, and since that time that country has strictly adhered to it, although the exigencies of war forced Great Britain to suspend her free gold market.

"France established the gold and silver standards in 1803, after the monetary disturbance that resulted

from the Revolutionary wars had ceased, and the United States adopted them in 1792. Silver was displaced by gold in France after great discoveries of gold in California in 1848 and in Australia in 1851, and for the same reason gold became the principal currency metal in the United States. Between 1848 and 1860 it is said that more than £100,000,000 of gold was coined in France, while an equivalent amount of silver was exported, principally to the eastern countries. One by one most of the progressive nations of the world have established the gold standard. This was done, for example, by Austria-Hungary in 1892, by Russia and Japan in 1897, by India in 1899 and by Mexico in 1904. The Chilean currency was reformed in 1895, when the gold standard was adopted. In fact, there are now few nations which are not committed in theory at least to the maintenance of the gold standard.

"Attempts have often been made to establish a stable system of money using both gold and silver as standards together, but the variability of value between the two precious metals has always brought difficulties. Various ratios between these two metals have been fixed by law, but it has not been found practicable to maintain these ratios permanently. Unless silver is supported by being made exchangeable with gold there is soon apt to be a growing disparity in value.

"It has taken a long time to fix in the minds of the people of the world the great advantages of the single gold standard and to teach the danger of permitting the debasement of this standard by any form of depreciation.

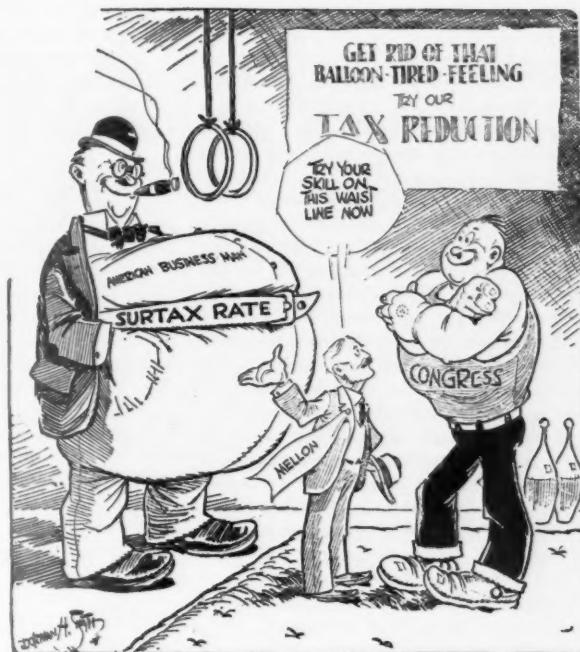
"Recent history has been furnishing some very striking examples of the disasters which are certain to follow the debasement of money through the unlimited issue of paper currencies lacking their required solid background of precious metals or other forms of value. Thus the exigencies of war and post-war conditions in Europe have been impelling the nations of that continent along the path of inflation and forcing them to the abandonment of the gold standard, with the result that they have brought upon themselves the many evils which have always characterized any debasement of the money system.

"Great Britain, Holland, South Africa, Australia and New Zealand recently returned to the gold basis.



Chicago Daily Tribune

We don't know what in the world we'd do if it wasn't for our rich uncle



Wallace Press-Times

Some Job

"Other countries that have passed through a similar experience of inflation and its dire consequences are Poland, Austria and Russia, and in all of them a degree of stability of currency has now been reached.

"Sweden is one of the European countries which has shown much skill in the management of its money system and has been the first nation there to restore its gold standard completely after the period of war difficulties."

The check-off, which has been the bone of bitter contention in all wage disputes in the anthracite industry, is again to the forefront in the conferences between the United Mine Workers and the anthracite operators. *The Black Diamond*, of Chicago, asserts that the check-off is not sound, is confiscatory, illegal and would violate the Sherman Act. They further state:

"The display of fireworks, wild accusations and demagogic personal attacks made by John L. Lewis at Scranton have ended with but one important definition of the attitude of the anthracite miners toward a new agreement beginning September 1. The check-off is demanded. It is sought because it

will save the union the work of making out 180,000 receipts a month and distributing some thousands of buttons. It is right because the companies keep a record of store supplies and can do this at the same time. It

is a part of the function of the anthracite operator because it is done in bituminous districts. It is right because it will enable the union to get a strangle-hold on that income it needs so much now. The operators must become a collection agency to see that workers pay their dues and their fines to the union.

"But none of these is a reason why the operator should turn his organization over to eliminate defects in the collection systems of the United Mine Workers. They are reasons why John L. Lewis wishes it. There are better reasons why operators should not surrender their organizations nor break the laws of the United States to meet every whim of the leader of the United Mine Workers. Theodore Roosevelt, Woodrow Wilson and Calvin Coolidge are only three examples of high type citizenry which has either condemned such a practice or given every indication of its impracticability. Two years ago John L. Lewis, himself, joined that group by offering to surrender the check-off if the operators would surrender their policy of checking off amounts due them for supplies purchased. A sound policy or principle is not so easily tossed aside.

"But it is not sound. It is confiscatory and illegal. The check-off of



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union dues would violate the Sherman Act. It is not American in origin or practice. It could not be justified in any court in this country. It is a travesty of the basic principles of common law. In addition to this, it is a flagrant and insolent attempt to force the function of the union down the throats of the operating companies, an effort to confiscate a portion of their organizations for the service of the union. Its practice elsewhere is not a legal nor moral justification for it. No other union in any other industry has asked for it. It is demanded because the union wants to force the operators to help it get a vise-like grip on its members. The tears shed by Mr. Lewis in his address at Scranton over the hazards of the anthracite industry dry quickly when the mercenary check-off cannot be railroaded through. It has nothing to do with full recognition of the union. Such an artificial plea is too transparent for discussion.

"The principle of the check-off in the anthracite fields is so weak and so obvious a violation of the rights of operators and the constitution itself that it cannot win. It will serve its usual purpose as something to jockey with and then it will disappear again for another term, as it did two years ago, with Mr. Lewis consenting."

In a recent issue of *Foreign Affairs*, an American quarterly review, in an article entitled "The Political Control of Mineral Resources," C. K. Leith attempts to show the trend toward nationalization and internationalization of all mineral resources, and to prove his point asserts that:

"In the United States the movement (for the nationalization of all mineral resources) has as yet been slight, but to show that it exists one only need cite the withdrawal of public lands from mineral entry, new leasing laws, the occupational tax on the iron ores of Minnesota, the special anthracite coal tax of Pennsylvania, the severance tax on minerals of Louisiana, the tax on oil and sulphur in Texas, and the appointment of coal and oil commissions."

Mr. Leith further asserts that while "most people familiar with the mineral industry are agreed that it would not have reached its present high state of development under bureaucratic direction and are naturally alarmed at the progress of nationalization, yet the thought is growing

that mineral deposits, so slowly accumulated by nature, are the heritage of all of the people and are not to be exploited exclusively for private gain, or if the exploitation is left in private hands it must be done in trust for the public."

On the internationalization of mineral resources, Mr. Leith states:

"One begins to hear the phrase 'internationalization of mineral resources.' It comes up in connection with the League of Nations, with the peace settlements, and with various projects for world peace. The phrase means different things to different

equally implies the belief that the desired results are not being properly accomplished by uncontrolled private trade or the fear that they will not be so accomplished in the future, and that therefore governments must collectively assume control.

"During the Great War the Allies went far in the direction of internationalization of their mineral resources by many measures of pooling and allocation. Before the armistice British and American officials gave consideration to a plan that after the war the exportable surplus of key raw materials controlled by the Allies (mainly by the United

States and Great Britain) should continue to be distributed as mutually agreed, as a means of controlling the commercial rehabilitation of the enemy countries during the reparation period. With this in mind, the exportable surpluses and deficits of key materials were listed and totalled for the several nations most concerned. One of President Wilson's fourteen points—"the removal, so far as possible, of all economic barriers and the establishment of an equality of trade conditions among all the nations consenting to the peace and associating themselves for its maintenance"—was interpreted in some quarters as requiring internationalization of key resources. These ideas received no expression in the Versailles Treaty. But since then the question has reappeared from time to time in connection with various international economic difficulties which were not solved by the Versailles Conference, and it has been given some attention by the Economic Committee of the League of Nations, following a resolution by the International Miners' Congress in 1920, 'that

there be constituted within a brief period in international office for the distribution of fuel, ores, and other raw materials indispensable for the revival of normal economic life.' Recent attempts by France, Germany, and Belgium to make satisfactory working and financial arrangements for the iron and steel industry of western Europe, already cited, are essentially attempts to secure some of the advantages which would follow the internationalization of the coal and iron ore supplies necessary to that industry.

"It seems inevitable that the tendency toward internationalization will continue, in the sense that governments will take a larger hand in the formulation of agreements relating to exploration (Continued on page 424)



A Scientific Method

people; the manner of its use often suggests that there is no well-considered plan in mind, that it is more or less of an academic abstraction. Yet the idea behind it is reasonably clear—that some arrangement should be made to protect nations weak in resources against nations better favored by nature; to prevent monopoly by any one nation or group of nations; to minimize the strenuous competition among nations, which sometimes leads to war; to prevent abuses in the exploitation of the resources of backward countries; to insure freedom of search and of international movement. The phrase implies a belief in the possibility of distributing the advantages of local environmental factors in accordance with some sort of political arrangement. It

STATISTICS OF COPPER INDUSTRY IN 1923 AND 1924

Geological Survey Issues Final Statistics Showing Production, Consumption, Importation, Exportation, Stocks and World Production of Copper—Smelter Production, Production, Which Shows Substantial Increase Over 1923

WITH the passing of the United States Geological Survey Statistical Division to the Department of Commerce, statistics formerly compiled for the mining industry by the Survey will hereafter be compiled by the Commerce Department. Just what changes will be made by Mr. Hoover remains to be seen. In the meantime, the Survey has released its final statistics on the production of copper in the United States in 1923 and 1924, which, as usual, were compiled by H. M. Meyer, who points out that 1924 production exceeded the high record for production and consumption established in 1923. These statistics also show:

Smelter production and withdrawals on domestic account in 1924 were surpassed only in 1916, 1917, and 1918 and the refined production from domestic and foreign sources only in 1917 and 1918. Consumption in 1924 was at a somewhat higher rate than production, and stocks of refined and blister copper decreased 60,000,000 pounds.

Imports of copper in 1924 attained a new high record, a total of 768,813,731 pounds being imported, as compared with 676,473,338 pounds in 1923, the previous year of highest record. The exports of metallic copper, 1,116,775,136 pounds, fell 8,872,200 pounds below the exports for 1917, but with the exception of those for 1917 they were the highest ever recorded. In 1924 the imports were over two-thirds as large as the exports, whereas in 1913 they were not one-half as large. This fact indicates that the greater part of the large increase in production is being consumed in the United States. Consumption in this country has reached very large proportions but is still far from its maximum, in view of the further

electrification of railroads, indicated expansion in the hydroelectric field, and prospective increases in other fields where the consumption of copper is large. Had consumption abroad increased in the same proportion as at home, there might have been less cause for dissatisfaction in regard to prices, although if European demand had been large, production, which in the United States has been considerably below capacity, would have materially expanded and a higher level for prices might not have resulted. Europe, in spite of unsettled political conditions in several of the countries that are large consumers, is now taking increasing quantities of copper.

Production of copper in Chile and the Belgian Congo has also reached a new high point, surpassing that of 1923, the previous year of highest record. In 1924 Chile produced approximately 187,324 metric tons, as compared with 182,384 metric tons in 1923, and the Belgian Congo 85,570 metric tons, as compared with 57,886 metric tons. Plans for a much larger output are being made by the Union Miniere du Haut-Katanga, but the Chile Copper Co. will probably not expand production until the price for copper is higher.

In 1924 there were no large consolidations, as there were in 1923. The much rumored merger of the Ray-Inspiration interests did not take place, apparently because of the inability of the companies interested to agree on the terms of a transfer of stock.

SMELTER PRODUCTION

The smelter production of primary copper from domestic sources during

1924 amounted to 1,634,249,192 pounds, an increase of approximately 14 percent. The value of smelter production increased approximately 1 percent in 1924. The average price of 2,620,000,000 pounds of copper delivered during the year, as reported to the Geological Survey by selling agencies, was 13.1 cents a pound.

In Table I the production is apportioned to the states in which the copper was mined. The figures represent the content of fine copper in the blister produced, the smelter output of ingot, and anode copper from Michigan.

REFINED COPPER

The total production of new refined copper in 1924 was 2,260,000,000 pounds, an increase of 280,000,000 pounds over that in 1923.

In addition to their output of metallic copper the regular refining companies produced bluestone (hydrated copper sulphate) having a copper content of 5,766,000 pounds, as compared with 7,987,000 pounds in 1923.

CONSUMPTION

The new refined copper withdrawn from the total year's supply on domestic account in the United States in 1924 and the method employed in determining it are shown in Table V, which does not include stocks of copper held by consumers.

IMPORTS AND EXPORTS

The figures of imports and exports of copper reported by the Bureau of Foreign and Domestic Commerce are shown in Tables VI and VII.

TABLE II—Summary of Features of the Copper Industry in the United States in 1923 and 1924

			1923	1924
Production of copper:				
Smelter output	pounds	1,434,999,962	1,634,249,192	
Mine production	do.	1,477,739,709	*	
Refinery production of new copper:				
Electrolytic	do.	1,302,454,492	1,499,223,447	
Lake	do.	137,691,306	145,333,227	
Casting	do.	24,019,197	29,657,925	
Total domestic	do.	1,464,164,995	1,674,214,599	
Total domestic and foreign	do.	1,979,835,616	2,260,076,010	
Total new and old copper	do.	2,802,000,000	*	
Or produced:				
Copper ore	short tons	45,519,817	*	
Average yield of copper	percent	1.58	*	
Copper-lead and copper-zinc ores	short tons	162,181	*	
Average price per pound	cents	14.7	13.1	
Imports (unmanufactured)	pounds	676,473,338	768,813,731	
Exports of metallic copper ¹	do.	828,854,827	1,116,775,136	
Withdrawn from total supply on domestic account:				
Total new copper	pounds	1,300,473,331	1,354,742,564	
Total new and old copper	do.	2,122,000,000	*	
Stocks of refined copper ²	do.	264,000,000	243,000,000	
Stocks of blister and materials in solution ³	do.	432,000,000	393,000,000	
Value of production in the United States	pounds	\$210,945,000	\$214,087,000	
World's production	do.	2,711,533,000	2,998,286,000	

* Figures not yet available. ¹ Total exports of copper, exclusive of ore, concentrates, composition metal, and unrefined material. ² At the end of the year.

TABLE VI—Copper Imported Into the United States in 1924 (in pounds)

Country	Ore (copper content)	Concentrates (copper content)	Mattes and regulus (copper content)	Unrefined black blister copper in bars, pigs, etc.	Refined in bars, plates, rods or other forms	Old and clippings for remanufacture	Composition metal, copper chief value
United Kingdom	155,647	922,254	497,101	2,812,324	2,409,884	128,373	21,180
France	592,511	6,048	13,642	3,376,036	633,645	9,588	1,312
Germany		37,818	21,159	44,990	17,200	59,043	14,862
Spain	10,812,123	284,785		16,505,918			
Canada	27,350,280	1,396,411	35,468	51,121,265	1,109,769	2,328,947	150,161
Mexico	2,987,404	22,687,382	48,500	69,963,716	477,252	10,317	
Cuba	11,969,920	11,429,580				521,909	
Bolivia	262,167						
Chile	46,584,230	1,352,352	145,030	124,283,121	141,247,852	35,840	
Peru	1,731,222	46,185	13,222	74,951,579		5,946	
Venezuela		1,908,480					
Australia				1,234,050			
British S. Africa				672,560			
Portuguese E. Africa	70,378			34,330,735			
Other Port. Africa				90,487,936			
Other countries	3,150,336	1,666,461	279,356	1,244,604	14,366	609,107	21,392
Total value	105,166,218	41,737,256	1,053,478	471,028,834	145,909,968	3,709,070	208,907
	\$12,807,225	\$4,693,029	\$125,288	\$59,462,150	\$18,556,174	\$402,260	\$43,170

TABLE III—Primary and Secondary Copper Produced by Regular Refining Plants and Imported, 1923-1924 (in pounds)

	1923	1924
Primary:		
Domestic:		
Electrolytic	1,302,454,492	1,499,223,447
Lake	137,691,306	145,333,227
Casting	24,019,197	29,657,925
	1,464,164,995	1,674,214,599
Foreign:		
Electrolytic	509,873,512	577,100,034
Casting	5,797,109	8,761,377
Refinery production of new copper	1,979,835,616	2,260,076,010
Imports of refined copper	160,711,227†	145,909,968
Total new refined copper made available	2,140,546,843	2,405,985,978
Secondary:		
Electrolytic	85,297,052	104,231,430
Casting	46,141,409	50,536,678
	131,438,461	154,818,108
	2,271,985,304	2,560,804,086

* The separation of refined copper into metal of domestic and foreign origin is only approximate, as an accurate separation of the amounts at this stage of manufacture is not possible. (The figures of imports of refined copper from Chile, reported by the Chile Exploration Co., have been inserted in place of the figures of the Bureau of Foreign and Domestic Commerce for Chile, which are undoubtedly very low.

TABLE IV—Stocks of Copper, January 1, 1921, 1922, 1923, 1924, and 1925 (in pounds)

Year	Refined copper	Blister and material in process of refining
1921	659,000,000	465,000,000
1922	459,000,000	232,000,000
1923	216,000,000	361,000,000
1924	264,000,000	432,000,000
1925	243,000,000	393,000,000

The amounts stated in the last column in the table above do not include copper in stock at foreign smelters or in transit from foreign smelters to refineries in the United States.

TABLE V—New Refined Copper Withdrawn from Total Year's Supply on Domestic Account, 1923-1924 (in pounds)

	1923	1924
Total supply of new copper	2,140,546,843	2,405,985,978
Stock at beginning of year	216,000,000	264,000,000
Total available supply	2,356,546,843	2,669,985,978
Copper exported	792,073,512	1,072,243,414
Stock at end of the year	264,000,000	243,000,000
	1,056,073,512	1,315,243,414

Withdrawn on domestic account

1,300,473,331 1,354,742,564

* Includes refined copper in ingots, bars, rods, or other forms.

PEAT PRODUCED AND SOLD IN THE UNITED STATES IN 1924

FIGURES compiled by the Geological Survey from reports submitted by 23 producers of peat show that in 1924 they sold 55,469 short tons, valued at \$395,470. These figures indicate a decrease in quantity but an increase in value as compared with those for the preceding year. The peat sold for use as fertilizer or as an ingredient of fertilizer amounted to 55,196 tons, valued at \$387,319, a decrease of 5 percent in quantity but an increase of 10 percent in value. Small quantities of peat were sold for use as fuel and as an ingredient of stock feed. The states making the largest output were New Jersey, Illinois, and California, ranking in the order named.

TABLE VIII—World's Production of Copper, 1920-1924 (smelter output in metric tons*)

(Prepared by W. L. Whiteside)

Where no footnotes are given, figures are taken from official publications. For countries from which ore or matte was exported for smelting, official figures have been converted to figures showing the quantity of copper recoverable by the smelters.

Country	1920	1921	1922	1923	1924
Canada	37,014	21,600	19,450	39,409	46,069†
Cuba		8,400‡	8,200‡	11,800‡	10,800‡
Mexico	49,192	15,228	26,978	53,372	49,052
United States	548,426	229,332	431,047	650,912	741,283
North America	643,032	274,360	489,275	754,693	847,204
Bolivia	9,982	10,592	10,531	10,049	7,439
Chile	98,952	59,239	129,575	182,384	187,324†
Peru	32,982	33,284	36,408	44,166	34,923
Venezuela	400‡	800‡	1,700‡	800‡	600‡
South America	142,316	103,915	178,214	287,399	230,286
Austria	1,645	4,277	4,593	4,833	4,227
Bulgaria	200‡	600‡	1,000‡	1,000‡	§
England	129	73	106	89	§
Finland	460‡	200‡	750‡	507‡	§
Germany	14,976	15,514	17,000	17,000	19,500
Italy	635	356	319	494	§
Norway	556	1,348	80	67	§
Portugal	1,000‡	1,500‡	600‡	400‡	§
Roumania	165‡	108‡	111‡	71‡	§
Russia	3,751	4,668	2,000	2,000	§
Spain	22,458	36,345	25,139	45,266	§
Sweden	1,289	1,149	.....	.....	§
Yugoslavia	2,436	4,144	5,354	6,788	8,145
Europe	49,700	70,382	57,052	78,515	§
China	191‡	958‡	813‡	849‡	§
India, British	520	1,161	1,054	190	§
Japan	67,792	54,092	54,126	59,346	61,946
Taiwan	692	1,197	1,096	707	§
Asia	69,195	57,408	56,589	61,092	§
Algeria	430‡	300‡	430‡	460‡	350‡
Belgian Congo	18,962	30,464	43,362	57,886	85,570
Rhodesia:					
Northern	132	200	181	132	82
Southern	2,820	2,794	3,074	2,697	2,565
Southwest African Protectorate	4,369	6,529	6,279	9,044	§
Union of South Africa	1,075	92	665	8,150	§
Africa	27,788	40,279	53,991	78,369	§
Australia	27,022	11,147	12,703	19,863	§
Grand total	959,053	557,591	847,824	1,229,981	1,360,800‡

* In addition to the countries shown, Chosen is reported to have produced 2,288 metric tons of crude copper in 1919 and 5,368 metric tons in 1920. Just what material this "crude copper" includes cannot be determined. † Preliminary. ‡ Estimated by the Geological Survey. § Data not available. For years ending March 31 following that stated in heading of column. || Exports of ingots and slabs.

MANGANESE PRODUCTION INCREASES IN 1924

Montana Largest Producer Of High Grade Manganese—Tariff Has Greatly Encouraged Production, Which Shows Substantial Increase Over 1923

THE shipments of high-grade manganese ore, containing 35 percent or more of manganese, from mines in the United States in 1924, made a large increase over the shipments in 1923, which in turn were considerably larger than those in 1922, according to the final figures compiled by H. M. Meyer, of the Bureau of Mines. The shipments in 1924 amounted to 56,515 gross tons, as compared with 31,500 tons in 1923, an increase of 79 percent. This large increase is due mainly to increased shipments from Montana, which again produced considerably more high-grade manganese ore than all the other states together, and to the shipments of ore from Washington, the first large shipments from that state. The ore from Washington contained an average of 52.88 percent of manganese and was used in the production of ferromanganese. By far the larger part of the ore from Montana in 1924 was chemical ore from Philipsburg. Less than 45 percent of the high-grade shipments of the entire country in 1924, however, was ore suitable for chemical uses, whereas in 1923 nearly 65 percent of the total was chemical ore. This does not mean that the shipments of chemical ore have decreased, for indeed they have increased, but that the shipments of ore for other uses have increased in larger proportion.

The tariff on manganese continues to encourage new operators to become producers of manganese, and a large number of new producers were active in 1924. However, the number of shippers who contributed only one or two carloads to the total is surprisingly large. This condition is exemplified in Georgia, where there were eight shippers of high-

grade ore in 1924 who made total shipments of only 1,093 gross tons, an average of less than 140 tons for each operator. As the number of shippers of high-grade ore was practically the same in 1924 as in 1923, and as there were many new operators in 1924, it is clear that a number of those who were operators in 1923 must have either worked out their deposits or found operations unprofitable.

Since September 21, 1922, the Bureau of Foreign and Domestic Commerce has reported the imports of manganese ore into the United States in terms of manganese content of ore imported instead of in terms of gross weight of ore, as previously. Imports from Cuba, how-

ever, which are not subject to the duty imposed on manganese ore, are still reported in terms of gross weight. Therefore, for purposes of comparison with former years, estimates of the gross weight of ores imported in 1922, 1923 and 1924 have been made by the Bureau of Mines on the basis of a manganese content of about 48 percent for all countries for which figures of gross weight are not available. This calculation shows that approximately 425,000 gross tons of manganese ore was imported in 1922, 419,000 tons in 1923, and 505,000 tons in 1924.

The shipments of domestic ore containing 10 to 35 percent of manganese decreased to 286,470 gross tons, valued

Country	1923		1924	
	Manganese content, gross tons	Value	Manganese content, gross tons	Value
British West Africa...	27,965	\$297,376	23,034	\$266,216
Argentina	928	20,040	.....	.....
Brazil	88,036	1,454,790	54,938	1,392,536
Chile	789	16,772	1,178	37,858
China	1	55	.....	.....
Cuba	†	137,016	†	347,874
England	287	36,375	65	3,431
Germany	146	14,654	48	5,659
Hongkong	20	1,020	278	8,838
India (British)	25,568	625,299	54,566	1,340,119
Java and Madura.....	6	369	.....	.....
Netherlands	26	1,664	3,632	153,709
Oceania (French)	†	36	.....	.....
Panama	400	5,300	.....	.....
Russia in Europe.....	11,670	262,790	41,097	1,050,832
Turkey: In Asia.....	3,005	86,798	.....	.....
In Europe.....	38,139	914,156	52,557	1,429,788
	§196,986	3,874,510	§231,393	6,036,860

* According to the Bureau of Foreign and Domestic Commerce.

† The imports from Cuba were reported as 9,062 gross tons of ore in 1923 and as 23,065 tons in 1924.

‡ Less than 1 ton.

§ Exclusive of the manganese content of Cuban ores.

Manganese and Manganiferous Ore (Exclusive of Flusing Ore) Shipped From Mines in the United States in 1924, by States, in Gross Tons.

State	Containing 35% or more manganese		Containing 10 to 35% manganese		Containing 5 to 10% manganese				
	No. shippers	Shipments	No. ship'r's	Shipments	No. ship'r's	Shipments			
Alabama	3	1,242	\$24,954	9	611	\$6,722			
Arizona	1	42	798	.....	.....	.....
Arkansas	6	3,400	60,350	6	7,991	37,170			
California	2	*	*	.....	.....	.....
Colorado	2	*	*	7	27,058	109,289			
Georgia	8	1,093	18,304	19	14,182	73,684			
Michigan .....	..	.....	.....	1	50,556	157,184
Minnesota	4	159,915	439,132	3	361,527	970,351	
Montana	6	35,445	939,919	.....	.....	.....
Nevada	3	1,310	13,579	3	2,591	15,997			
New Mexico	2	775	*	2	23,246	*			
Tennessee	2	455	11,611	..	.....	.....
Utah	2	116	1,010		
Virginia	3	1,565	59,220	2	204	*			
Washington	1	5,000	100,000		
Wisconsin	1	175,316	\$16,558	
Undistributed	6,188	78,742	89,202	
	39	56,515	1,307,477	55	286,470	929,390	12	587,026	1,713,943

* Included under "Undistributed"; Bureau of Mines not at liberty to publish.

at \$929,390, in 1924, from 319,666 tons, valued at \$1,158,628, in 1923. Shipments of ore containing 5 to 10 percent of manganese decreased to 587,026 gross tons, valued at \$1,713,943, in 1924, from 1,072,457 tons, valued at \$3,598,327, in 1923. The large decrease in shipments of ore of this grade is in part due to classification once more as iron ore of the ore from the Tilden mine of the Oliver Iron Mining Co. In just one year—1923—the ore from this mine contained sufficient manganese to justify its classification as a manganeseiferous iron ore instead of as an iron ore. On the other hand, the Ottawa mine of the Montreal Mining Co. again in 1924 shipped ore which had a manganese content sufficiently high to cause it to be included with the ore containing 5 to 10 percent of manganese.

SALES OF FELDSPAR IN 1924

THE crude feldspar sold in the United States in 1924 amounted to 203,000 long tons, valued at \$1,488,500, or \$7.32 a ton, according to a statement prepared from reports received directly from producers and issued through the Geological Survey in cooperation with the state geological surveys of Maryland, New York, North Carolina, and Virginia. These figures show an increase of 40 percent in quantity and 41 percent in value as compared with 1923. Feldspar was mined and sold in 1924 in Arizona, California, Colorado, Connecticut, Maine, Maryland, New Hampshire, New York, North Carolina, Pennsylvania, South Dakota, and Virginia, a gain of one state—South Dakota—as compared with 1923. The greatest feldspar-producing region is in the Atlantic seaboard states from Maine to North Carolina. This region reported 95 percent of the output for 1924. North Carolina, the leading state, reported about 47 percent of the quantity sold; New Hampshire, the second, reported 19 percent; and Maine, the third, 15 percent. The average value per long ton in North Carolina was \$6.46; in New Hampshire it was \$8.22; and in Maine it was \$9.07.

In 1924 there were 32 commercial mills for grinding feldspar in California, Connecticut, Delaware, Illinois, Maine, Maryland, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, and Tennessee. These reported 189,780 short tons of ground feldspar sold in 1924, valued at \$3,283,170, or \$17.30 a ton. Of this quantity, 163,905 tons, valued at \$2,760,286, or \$16.84 a ton, was domestic feldspar and 25,875 tons, valued at \$522,884, or \$20.21 a ton, was Canadian feldspar. Canadian feldspar was ground in two states—New York and Ohio. These figures represented small increases in quantity and value of both domestic and Canadian ground feldspar as compared with 1923.

THE IRON INDUSTRY IN 1924

Considerably Less Iron Ore, Pig Iron, And Ferroalloys Were Produced and Shipped In The United States in 1924 Than In 1923, According To Figures Compiled By The Bureau of Mines

ACCORDING to figures compiled by A. H. W. Davis, for the Bureau of Mines, the iron ore mined in 1924 amounted to 54,267,419 gross tons, a decrease of 22 percent as compared with 1923. Of the 20 states producing iron ore in 1924, only five—Alabama, Missouri, Ohio, Utah, and Washington—contributed more ore than in 1923. The shipments of iron ore in 1924 amounted to 52,083,375 gross tons, valued at \$151,307,105, a decrease in quantity of 25 percent and in value of 37 percent as compared with 1923. The average value per ton of iron ore at the mines in 1924 was \$2.91, which is 54 cents less than in

1923. The stocks of iron ore at the mines at the end of 1924 amounted to 12,410,619 gross tons, compared with 10,165,875 tons at the end of 1923, an increase of 22 percent.

Pig Iron

The shipments of pig iron in 1924, amounting to 31,064,129 gross tons, valued at \$665,078,972, showed a decrease of 19 percent in quantity and 30 percent in total value. The general average value of pig iron of all grades at the furnaces in 1924 was \$21.41, a decrease of \$3.27 from the value in 1923.

Iron Ore Mined in the United States in 1923 and 1924, in Gross Tons (Exclusive of Ore Containing 5 Percent or More of Manganese)

State	1923	1924	Pct. of inc. or dec. in 1924
Alabama	6,783,146	6,993,613	+ 3
California	2,779	435	- 84
Colorado	4,102	4,702	+ 15
Georgia	117,321	113,039	- 4
Idaho	1,290	...	- 100
Michigan	14,174,468	12,350,755	- 13
Minnesota	44,348,296	31,902,085	- 28
Missouri	53,546	79,847	+ 49
Montana	17,751	3,913	- 78
Nevada	9,578	...	- 100
New Jersey	307,733	65,197	- 79
New Mexico	205,218	189,371	- 8
New York	541,922	255,832	- 53
North Carolina	59,684	12,525	- 79
Ohio	...	244	...
Pennsylvania	993,441	807,208	- 19
Tennessee	267,275	179,853	- 33
Utah	57,752	164,154	+ 184
Virginia	155,977	89,792	- 42
Washington	...	1,700	...
Wisconsin	871,416	690,058	- 21
Wyoming	378,747	363,096	- 4
	69,351,442	54,267,419	- 22

Iron Ore Mined in the United States, by Mining Districts and Varieties, in 1923 and 1924, in Gross Tons (Exclusive of Ore Containing 5 Percent or More of Manganese)

District	1923	Hematite	Brown ore	Magnetite	Carbonate	Total	Pct. of inc. or dec. in 1924
Lake Superior*	59,196,734	...	...	88,674	...	59,285,408	...
Birmingham	5,740,233	306,675	...	...	...	6,046,908	...
Chattanooga	404,948	229,102	...	...	...	634,050	...
Adirondacks	...	...	...	460,311	...	460,311	...
North'n New Jersey and southeast'n New York	...	...	...	376,495	...	376,495	...
Other districts	†582,539	†697,071	1,265,144	3,516	2,548,270	...	...
Totals	†65,924,454	†1,232,848	2,190,624	3,516	69,351,442	...	...
1924							
Lake Superior*	44,796,766	...	...	44,953	...	44,841,719	- 24
Birmingham	6,214,381	296,931	...	...	...	6,511,312	+ 8
Chattanooga	376,693	171,004	...	...	...	547,697	- 14
Adirondacks	...	...	...	197,437	...	197,437	- 57
North'n New Jersey and southeast'n New York	...	...	...	110,626	...	110,626	- 71
Other districts	†714,460	†346,224	994,695	3,249	2,058,628	- 19	...
Totals	†52,102,300	†814,159	1,347,711	3,249	54,267,419	...	...

* Includes only those mines in Wisconsin which are in the true Lake Superior district.

† Some hematite included with brown ore.

Ferroalloys

A decrease of 14 percent in the shipments of ferroalloys is shown for

1924. The shipments of ferromanganese showed an increase in 1924 but those of spiegeleisen decreased.

Iron Ore Shipped from Mines in the United States, 1923 and 1924, by States (Exclusive of Ore Containing 5 Percent or More of Manganese and of Ore Sold for Paint)

State	1923		1924		Percentage of increase or decrease	
	Gross tons	Value	Gross tons	Value	Quantity	Value
Alabama	6,922,663	\$15,540,198	6,557,596	\$13,927,551	-5	-10
California	2,769	18,665	435	†	-84	...
Colorado	4,102	†	4,702	†	+15	...
Georgia	117,286	300,712	112,059	285,128	-4	-5
Idaho	1,290	†			-100	-100
Michigan	14,065,561	54,110,070	11,248,641	35,605,902	-20	-34
Minnesota	44,556,053	158,402,788	31,076,114	93,311,092	-30	-41
Missouri	54,348	247,975	79,847	405,622	+47	+64
Montana	17,751	51,039	3,913	10,846	-78	-79
Nevada	9,578	†			-100	-100
New Jersey	349,435	1,403,723	101,123	420,488	-71	-70
New Mexico	205,218	†	189,371	†	-8	...
New York	722,096	3,242,229	303,386	1,448,616	-58	-55
North Carolina	59,684	161,603	12,525	32,512	-79	-80
Ohio		244		†	...	...
Pennsylvania	988,586	2,264,485	807,411	1,881,122	-18	-17
Tennessee	266,175	677,753	179,293	431,682	-33	-36
Utah	57,752	205,936	164,154	234,348	+184	+14
Virginia	200,966	664,240	91,759	250,279	-54	-62
Washington		1,700		†	...	...
Wisconsin	831,412	2,421,194	786,006	2,044,762	-5	-16
Wyoming	378,747	†	363,096	†	-4	...
Undistributed		*1,026,311		*1,017,155	...	...
Totals	69,811,472	\$240,738,921	52,083,375	\$151,307,105	-25	-37

* This figure includes value for states entered as "†" above.

† Included under "Undistributed."

Pig Iron Shipped from Blast Furnaces in the United States in 1923 and 1924, by States

State	1923		1924		Percentage of increase or decrease	
	Gross tons	Value	Gross tons	Value	Quantity	Value
Alabama	2,784,625	\$64,912,809	2,667,361	\$55,791,228	-4	-14
Colorado	*	*	*	*	...	...
Illinois	3,741,002	94,878,917	2,695,961	59,299,519	-28	-37
Indiana	3,021,504	70,270,894	2,571,411	52,507,720	-15	-25
Kentucky	154,680	*	99,055	*	-36	...
Maryland	489,137	*	539,188	*	+10	...
Massachusetts	1,667	*	50	*	-97	...
Michigan	717,279	18,827,808	650,333	15,225,990	-9	-19
Minnesota	418,726	*	189,033	*	-55	...
Missouri	4,513	*	21,371	*	+374	...
New Jersey	*	*	*	*	...	...
New York	2,426,522	57,543,779	1,914,545	38,150,486	-21	-34
Ohio	8,964,805	222,009,553	7,434,487	159,701,131	-17	-28
Pennsylvania	13,898,624	347,679,274	10,962,288	237,052,035	-21	-32
Tennessee	215,009	5,793,756	126,660	2,782,154	-41	-52
Utah		*	*	*	...	...
Virginia	238,742	6,389,149	94,462	2,268,022	-60	-65
West Virginia	506,543	12,499,112	453,944	9,884,019	-10	-21
Wisconsin	280,457	7,264,981	172,435	3,945,369	-39	-46
Undistributed	†497,544	†38,729,346	†471,545	†28,471,299	...	...
Totals	38,361,379	\$946,799,378	31,064,129	\$665,078,972	-19	-30

* Included under "Undistributed."

† Includes figures for states marked ".*"

Ferroalloys Shipped from Furnaces in the United States, 1923 and 1924

Variety of alloy	1923		1924		Value
	Gross tons	Value	Gross tons	Value	
Ferromanganese	226,365	\$23,853,313	*232,821	*\$23,533,668	
Spiegeleisen	134,086	4,547,113	76,179	2,354,731	
Ferrosilicon (7 per cent or more silicon)	184,067	9,940,772	150,021	7,558,984	
Ferromolybdenum	118	297,842	107	254,970	
Ferrotungsten	1,485	2,177,685	741	1,110,553	
Ferrovanadium	1,432	3,765,344	1,355	3,641,724	
Other varieties†	32,264	5,295,162	36,020	4,795,318	
Totals	579,817	\$49,877,231	497,244	\$43,249,948	

* Includes a small quantity of silico-manganese.

† Ferrocarbide, ferrochromium, ferrophosphorus, ferrotitanium, ferrosilicon, and zirconium-ferrosilicon.

NATURAL SODIUM COMPOUNDS AND BORATES IN 1924

THE production of sodium compounds, not including common salt, from natural salines and brines in the United States in 1924 amounted to 76,420 short tons, valued at \$1,825,850, it is announced by the Bureau of Mines, Department of Commerce. These figures show an increase of 29 percent in quantity and of 3 percent in value over 1923. They cover the output of sodium carbonate, bicarbonate, sulphate, trona, and borate in various forms.

Sodium carbonate (soda ash) and sodium bicarbonate were produced from Owens Lake by the Inyo Chemical Co., at Cartago, and the Natural Soda Products Co., at Keeler, Calif. There was an increase in the sales of each of these products as reported in 1924, but a decrease in average value a ton. Hydrated sodium carbonate (sal soda) was produced by the Wyoming Soda Products Co., at Green River, Sweetwater County, Wyo. Sodium sulphate (salt cake) was produced at Clarkdale (P. O. Camp Verde), Yavapai County, Ariz., by the Western Chemicals, Inc.; near McKittrick, Calif., by the Pacific Distributing Corporation of Nevada; and at Wabuska, Nev., by George Elder. The properties at Clarkdale, Ariz., and Wabuska, Nev., were producing for the first time in 1924. Hydrated sodium sulphate (Glauber's salt) was produced at Casper, Wyo., by D. W. Gill. Trona, a double salt of sodium carbonate and sodium bicarbonate, was produced by the Natural Soda Products Co., at Keeler (Owens Lake), and by the American Trona Corp., at Trona (Searles Lake), Calif.

The output of boron minerals in 1924 amounted to 116,110 tons, valued at \$3,183,910, compared with 136,650 short tons, valued at \$3,994,790 in 1923. These include borax (sodium borate) produced at the plant of the American Trona Corp., Trona, Calif., and colemanite (calcium borate) mined at Death Valley Junction and Lang, Calif., by the Pacific Coast Borax Co.; at Muroc, Calif., by the Suckow Chemical Co.; at Las Vegas, Nev., by the Westend Chemical Co.; at Moapa, Nev., by the American Borax Co.

It is reported that the exploitation of deposits of sodium salts may soon be undertaken near Tonopah, Nev., Salt Lake, Utah, and in Okanogan County, Wash.

NATURAL ABRASIVES IN 1924

THE production in 1924 of the natural abrasives was about 190,000 short tons, valued at nearly \$4,000,000, as reported by the Geological Survey. In addition there were manufactured in 1924 more than 60,000 tons of artificial abrasives, valued at \$6,213,740.

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PRODUCTION OF CLAY IN 1924

THE output of clay mined and sold as clay in the United States in 1924 amounted to 3,676,720 short tons, valued at \$11,478,756, or \$3.12 a ton, according to Jefferson Middleton, of the Bureau of Mines, Department of Commerce. These figures show an increase of about 7 percent in quantity and 3 percent in value, as compared with those of 1923. They represent only clay sold as clay, or mined under royalty, and do not include the much greater quantity of clay that was burned into clay products by the producers themselves from their own property. The data were collected by the United States Geological Survey in cooperation with state geological surveys of Alabama, Florida, Georgia, Illinois, Iowa, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Virginia, Washington, and Wisconsin, before the transfer of the Mineral Resources Division of the Geological Survey to the Bureau of Mines.

The output of kaolin, the clay that is used in making high-grade pottery and porcelain as well as paper, oilcloth, and other products, and is generally considered the highest grade of clay, amounted to 326,602 tons, valued at \$2,923,965, a decrease of 3 percent in quantity, as compared with 1923, with practically the same value as for 1923. The clay of largest production and value is fire clay. The output of fire clay was the largest ever recorded—2,429,320 tons—and was 6 percent greater than that of 1923 and 3 percent greater than that of 1917, the year of largest output previous to 1924. The value of the fire clay output of 1924 was \$6,708,283, an increase of 2 percent, as compared with 1923, but a decrease of 5 percent as compared with 1920, the year of greatest value of fire clay. The output of clay of every kind decreased in quantity and value in 1924 except fire clay and miscellaneous clay, which consists largely of clays used for heavy clay products such as building and drainage materials.

The imports of clay increased in quantity and value in 1924, as compared with 1923, and the exports decreased in quantity but increased in value. The imports of clay amounted to 444,100 short tons, valued at \$3,976,040, an increase of 13 percent in quantity and 8 percent in value. Exports of clay in 1924 amounted to 72,755 tons, valued at \$732,716. This was a decrease of 14 percent in quantity and an increase of 16 percent in value, as compared with 1923. Kaolin, or china clay, constituted 80 percent of the total imports in 1924. Fire clay, the principal clay exported, amounted to 57 percent of the total.

MINERAL PRODUCTION IN OREGON IN 1924

THE mine production of gold, silver, copper and lead in Oregon in 1924 is reported as having a total valuation of \$678,072 by James M. Hill, of the Bureau of Mines. This figure represents a decrease of \$89,518 from the 1923 production of these metals, which was valued at \$767,590. The number of producers of these metals operating in 1924 was 114, which compares with 206 operations that were active in 1923.

The production of these ores in Oregon in 1924 amounted to 44,842 short tons, as compared with 50,385 short tons produced in 1923. The output of gold in the state in 1924 is reported as 26,695.36 fine ounces, as compared with the production of 24,091.14 fine ounces in the year previous. The output of silver in 1924 is placed at 38,103 fine ounces, as against 96,322 fine ounces mined in 1923.

The recoverable copper in Oregon ores mined in 1924 amounted to 768,395 pounds, which compares with a production of 1,283,476 pounds for 1923.

Baker County, with 29 reporting producers, had the largest number of active metal mines in 1924. This county, with a production of 37,239 short tons of ore valued at \$441,770, also led from the standpoint of quantity of output. Baker County ranked first in the production of gold, its output being reported as 15,685.71 fine ounces. Grant County, with an output of 8,280.89 fine ounces, ranked second. Baker County also led in silver production, with a report of 26,581 fine ounces, while Grant County was also second in this respect, reporting 10,858 fine ounces. The great bulk of the copper production, 761,141 pounds, was from Baker County.

*Mine Production of Gold, Silver, Copper, and Lead in Oregon in 1924, by Counties
By JAMES M. HILL, Bureau of Mines, Department of Commerce*

County	No. pro- ducers	Ore, short tons	* Gold, fine ozs.	* Silver, fine ozs.	Copper, pounds	Lead, pounds	Total value
Baker	29	37,239	15,685.71	26,581	761,141	...	\$441,770
Coos	3	.....	35.84	3	.....	.....	743
Crook	1	.....	3.08	2	.....	.....	65
Curry	6	271	385.22	47	.....	.....	7,994
Douglas	6	17	128.85	91	88	.....	2,737
Grant	17	6,137	8,280.89	10,858	947	513	178,621
Jackson	16	98	566.73	101	.....	.....	11,783
Josephine	25	309	1,094.66	152	.....	.....	22,731
Lane	1	100	97.06	46	.....	.....	2,037
Linn	2	.....	12.58	4	.....	.....	263
Malheur	6	600	397.83	112	.....	.....	8,299
Marion	1	71	.....	105	6,219	.....	885
Wheeler	1	.....	6.91	1	.....	.....	144
Total, 1924..	114	44,842	26,695.36	38,103	768,395	513	+\$678,072
Total, 1923..	206	50,385	24,091.14	96,322	1,283,476	27,523	+\$767,590

* Includes placer production.

† Average value of metals: Gold, \$20.671835 per ounce; silver, \$0.67 per ounce; copper, \$0.131 per pound; lead, \$0.08 per pound.

‡ Average value of metals: Gold, \$20.671835 per ounce; silver, \$0.82 per ounce; copper, \$0.147 per pound; lead, \$0.07 per pound.

GYPSUM MINED AND SHIPPED
IN 1924

THE quantity of gypsum mined in 1924 was 5,042,629 short tons, an increase of 289,181 tons, or 6 percent over 1923, according to a statement made public by the Bureau of Mines, Department of Commerce. The value of sales of both crude and calcined gypsum was \$42,724,507, an increase of \$7,836,-

352, or 22 percent; 3,568,569 tons was sold calcined and 982,108 tons in crude form, chiefly for use in Portland cement but including 22,298 tons sold as agricultural gypsum. The figures are based on reports submitted by 72 operators of gypsum mines to the Mineral Resources Division of the United States Geological Survey before the transfer of that division to the Bureau of Mines.

State	Number of active plants report- ing	Total quantity mined (short tons)	Gypsum Produced and Sold in the United States, 1924, by States			Total Value
			Sold without calcining	Sold calcined	Short tons	
Iowa	6	727,385	150,450	\$375,155	489,745	\$5,277,910
Kansas	3	141,908	47,509	116,681	77,796	777,512
Michigan	8	577,526	124,134	324,140	453,135	5,626,682
Nevada	6	365,714	*	*	278,467	2,001,130
New York	13	1,474,491	335,841	982,777	1,019,319	13,346,469
Ohio	4	525,485	17,757	49,579	477,845	5,563,913
Oklahoma	5	316,134	64,980	157,748	201,762	2,442,333
Texas	7	402,245	32,233	62,314	301,512	2,566,736
Utah	4	90,221	34,793	41,104	43,590	292,253
Wyoming	3	32,715	*	*	25,095	189,871
Other States†	13	388,805	\$174,411	\$564,822	200,303	1,965,378
Total	72	5,042,629	982,108	2,674,320	3,568,569	40,050,187
						42,724,507

* Included under "Other States." † Arizona, California, Colorado, Montana, New Mexico, Oregon, South Dakota and Virginia. ‡ This figure includes also output of States entered as "(*)" above.

MINERAL PRODUCTION IN ARIZONA IN 1924

THE mine production of gold, silver, copper, and lead in Arizona in 1924 amounted to \$99,610,379, according to statistics compiled by Victor C. Heikes, of the Bureau of Mines. The figure indicates a decrease of \$4,690,821 from the 1923 output of these metals, which was placed at \$104,301,200. The production of ore in 1924 was 19,820,505 short tons, as compared with 17,015,178 short tons reported in 1923. The output of gold in Arizona in 1924 amounted to 235,995.74 fine ounces, as against 296,109.23 fine ounces in 1923.

The silver output in 1924 is recorded as 6,649,276 fine ounces, compared with 7,343,742 fine ounces in 1923. The recoverable copper in Arizona ores mined in 1924 was 677,752,013 pounds, as compared with the 1923 output of 618,928,602 pounds, and the recoverable lead in ores mined in 1924 is placed at 18,642,314 pounds, as against 16,291,548 pounds for 1923.

Gila County recorded the largest value for metals mined in 1924, the total amounting to \$25,590,361. Cochise

County, with a total value of \$22,703,249, ranked second, while Yavapai County, with \$21,547,976, was third.

Mohave County ranked first in gold production, with an output of 78,513.98 fine ounces. Cochise County was the largest silver producer, with an output of 2,381,117 fine ounces. Gila County, with an output of 190,458,709 pounds, led the copper producing counties. Cochise County was by far the largest lead producer, the figure being 14,572,524 pounds.

*Mine Production of Gold, Silver, Copper, and Lead in Arizona in 1924, by Counties
By Victor C. Heikes, Bureau of Mines, Department of Commerce*

County	Number of producers	Ore Short tons	Gold* Fine ounces	Silver* Fine ounces	Recoverable Copper Pounds	Recoverable Lead Pounds	Recoverable Zinc Pounds	Total Value
Cochise	40	2,586,123	64,059.48	2,381,117	142,121,157	14,572,524	.....	\$22,703,249
Gila	23	8,413,022	8,388.80	652,794	190,458,709	368,580	.....	25,590,361
Graham	6	127	2.18	782	4,057	59,927	.....	5,894
Greenlee	4	1,086,639	2,642.19	92,250	41,048,563	10,036	.....	5,494,592
Maricopa	10	48,163	2,695.94	4,035	960	8,196	.....	59,215
Mohave	52	124,677	78,513.98	246,934	10,634	1,416,717	.....	1,903,204
Pima	29	3,010,553	11,052.24	208,745	67,279,575	415,953	.....	9,215,229
Pinal	22	3,137,942	8,300.57	709,301	93,198,060	362,532	.....	12,884,769
Santa Cruz	32	3,932	327.16	69,192	92,026	1,111,018	.....	154,059
Yavapai	43	1,407,479	59,944.22	2,269,788	143,348,230	118,041	.....	21,547,976
Yuma	14	1,848	68.98	14,338	190,042	198,790	.....	51,831
Total 1924	275	19,820,505	235,995.74	6,649,276	677,752,013	18,642,314	.....	\$99,610,379
Total 1923	341	17,015,178	296,109.23	7,343,742	618,928,602	16,291,548	519,103	\$104,301,200

* Includes placer production.

† Average value of metals: Gold, \$20.671835 per ounce; silver, \$0.67 per ounce; copper, \$0.131 per pound; lead, \$0.08 per pound.

‡ Average value of metals: Gold, \$20.671835 per ounce; silver, \$0.82 per ounce; copper, \$0.147 per pound; lead, \$0.07 per pound; zinc, \$0.068 per pound.

PRODUCTION OF METALS FROM SECONDARY SOURCES IN 1924

THE recovery of metal from secondary sources in 1924 is reported to the Bureau of Mines, Department of Commerce, as having a value of \$198,888,600, which is \$6,530,000 less than in 1923. The decline, according to J. P. Dunlop, who compiled the figures, is due to the smaller quantity of brass scrap remelted and the lower average price of copper in 1924.

As was anticipated, the peak of production of remelted brass scrap was reached in 1923, and the pronounced decrease in 1924 indicates that the accumulation of brass during the war period has been absorbed. The quantity of scrap copper treated at regular refineries treating ore showed an increase of nearly 12,000 tons, but the secondary smelters recovered about 11,000 tons less copper

than in 1923. There was an increase of about 16,000 tons in the lead content of alloys (including antimonial lead), though the quantity of pig lead from scrap decreased about 6,000 tons. Zinc recovered by redistillation, sweating, and remelting decreased 6,300 tons, mainly due to a smaller output of redistilled zinc at regular smelters. There was a small increase in zinc in alloys other than brass. As large quantities of zinc drosses, skimmings, ashes, etc., are used to make zinc dust, zinc sulphate, lithopone, and zinc chloride, it is probable that use for such products together with the quantities exported accounts for the smaller quantity of zinc recovered by redistillation and remelting in 1924. The secondary recovery of tin as metal was less in 1924 than in 1923, but tin recovered in alloys and chemical compounds increased about 6 percent. The quantity of clean tin plate scrap treated in 1924 was slightly larger than in 1923, but for the first time in many years no tin was recovered from old tin-coated containers, as the high cost of collecting and shipping old cans precluded their use. The secondary recoveries of aluminum, antimony, and nickel all increased in quantity and in value in 1924.

Secondary Metals of Certain Classes Recovered in the United States in 1923 and 1924

	1923 Short tons	Value	1924 Short tons	Value
Copper, including that in alloys other than brass	193,200	\$ 56,800,800	196,500	\$ 51,483,000
Brass scrap remelted	311,000	72,843,800	274,000	58,444,200
Lead as metal	96,430	90,400	.....	.....
Lead as alloys	98,060	27,228,600	114,100	32,720,000
Zinc as metal	65,210	58,886	.....	.....
Zinc in alloys other than in brass and in chemical compounds	8,630	10,042,200	10,500	9,020,200
Tin as metal	7,892	7,700	.....	.....
Tin in alloys and chemical compounds	22,318	25,316,000	23,600	29,371,900
Antimony as metal	245	1,252,800	90	2,025,600
Antimony in alloys	7,776	9,314	.....	.....
Aluminum as metal	6,800	10,824,600	10,350	14,596,200
Aluminum in alloys	14,500	16,650	14,227,500	14,227,500
Nickel as metal	177	1,109,800	114	1,227,500
Nickel in nonferrous alloys and salts	1,378	2,126	.....	.....
	\$205,418,600		\$198,888,600	

NEWS OF THE MINING FIELD

A Résumé Of The Activities Of The Mining Industry And Items Of Interest In The Field

Consolidations in Bituminous Fields

Consolidation of ownership in the bituminous fields has been cited by some experts as the solution which would be most likely to permit the closing down of high cost operations and the carrying of these properties as future reserves, working those mines which will produce coal most economically, up to the limit of demand.

It has been pointed out that there are ample precedents in various industries to indicate the possibilities in such amalgamations. Some tendency towards grouping of operations under a single ownership and management has been evidenced during the past year.

Several such mergers are now under consideration. One involves over 60 properties in northern West Virginia, valued at approximately \$100,000,000, which is expected to be completed shortly, provided that operators agree on terms of consolidation.

Two mergers in the Eastern Ohio No. 8 district are under way, which, when completed, will place practically the entire No. 8 field under the control of two corporations. The larger is expected to consist of the Youghiogheny & Ohio Coal Company, Lorain Coal & Dock Company, Clarkson Coal Mining Company, Pittsburgh & Ohio Mining Company, Maher Collieries Company, Central Coal Company, United States Coal Company and two or three smaller concerns. The smaller consolidation is expected to center around the Wheeling & Lake Erie Coal Company.

Railroads Attempting to Destroy U. M. W., Says Lewis

"Certain railroads, large purchasers of bituminous coal, have for many months past bent every effort to starve out certain fields and force the men back to work at a lower wage scale," said John L. Lewis at the tridistrict convention of the United Mine Workers. "These railroads withdrew from buying bituminous coal in the union fields and went to the nonunion fields. They demoralized and pauperized the bituminous fields in their own coal-originating territory in an attempt to destroy the United Mine Workers. In the conduct of their campaign they threw business morality to the winds and the wage agreement was torn up like a scrap of paper."

New Distillation Process Yields \$10.50 in By-products from Ton of Coal

The Ford Motor Company, through a new process of low carbonization for distilling soft coal, perfected by a Belgian inventor by the name of Piron, has produced by-products worth around \$10.50 from every ton of soft coal costing \$5. Ford engineers estimate that the new process will produce by-products of soft coal as follows: 5,000 cubic feet of gas; 25 gallons of tar; 15 pounds of ammonium sulphate; 5 gallons of motor fuel; ¼ of a ton of coke.

Collaborating with Piron, Mr. Ford built a temporary plant at Huntington, W. Va., for experiments with the process and subsequently decided to install adequate coke ovens at the River Rouge plant where soft coal will be distilled on a large scale.

Lehigh Coal & Navigation Briquet Plant

One of the most interesting developments in connection with the coal operations of the Lehigh Coal & Navigation Company has been its development recently of a process for the manufacture of a domestic coal out of culm. The product is a hard coal briquet, and the company's engineers believe that it will revolutionize the anthracite industry. The company has formed a subsidiary, the Navicoal Corporation, and has erected a plant for the manufacture of the briquets at Perth Amboy, N. J.

Liquid Fuel From Powdered Coal

At the University of Birmingham England, Prof. A. W. Nash has been investigating liquid fuel prepared from powdered coal. By heating powdered coal to high temperatures under high pressures in an atmosphere of hydrogen a liquid fuel is obtainable. It is claimed that the production of this liquid can be established on a commercial basis, and further investigations are under way with that object in view.

Coal Mines Sold under Foreclosure

The Smith Pocahontas Coal Company, Wyoming County, W. Va., on the main line of the Virginian Railway, has been sold at auction for \$75,000 to satisfy a mortgage. This property is equipped to mine and ship 10,000 tons of coal a

month, and three or four years ago the stockholders refused an offer of a half a million dollars for their holdings.

The Beckley Pocahontas Coal Company, in Raleigh County, was sold recently for \$35,000, which compares with \$750,000, the price paid for it in 1920.

Accidents from Falls of Roof and Coal

In the capacity of consulting engineer of the Bureau of Mines, Dean E. A. Holbrook, Pennsylvania State College, has commenced a study of the causes of accidents from falls of roof and coal. He will make a very extensive survey during the summer months of every possible factor entering into such accidents, and in connection with this survey will visit numerous mining properties.

Screen Sizing of Coal, Ores and Other Minerals

An investigation of the screen sizing of coal, ores, and other minerals has been completed by the United States Bureau of Mines in cooperation with the Illinois State Geological Survey and the Engineering Experiment Station of the University of Illinois.

The Bureau of Mines points out that sizing is an important operation in every ore-dressing, coal-dressing, or other mineral-preparing plant for reducing the product to a form more concentrated or more convenient for utilization than that in which it was mined. In ore dressing the ore must be screened or otherwise classified in a series of sizes during or after crushing and before it is treated to separate valuable mineral from the waste or the gangue. Moreover, no crushing machine will produce a finished product cheaply and continuously unless screens are used. In coal preparation, market requirements, convenience, custom, and efficiency in combustion necessitate grading mined coal by sizes, even though no separation of coal from contained refuse is attempted later. If such a separation is to be made, however, the coal-washing or other coal cleaning machinery will be most efficient when treating only a small range of sizes of coal at once. All ore-dressing and coal preparation plants, therefore, contain what is called screening, sizing, or grading apparatus.

Copies of this bulletin, No. 234, by E. A. Holbrook and Thomas Fraser, con-

taining detailed results of the investigation, may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

General Rate Investigation

Investigation of the entire freight rate structure, as provided in the Hoch-Smith Law, and the application of 74 western railroads for rate increases have been assigned for initial hearing at Chicago, September 1, by the Interstate Commerce Commission.

The commission has decided to first deal with the western district to determine what products of agriculture are affected by depression and what reductions, if any, may be made in these rates; and what rates on particular commodities or classes of traffic may be increased to compensate for such reductions as may be found necessary in order to increase railroad revenues.

Iron Ore Shipments on Lakes Increase

For the season to July 1 shipments of iron ore from the Lake Superior district aggregated 18,393,185 tons, compared with 14,827,127 tons last year. The Duluth, Missabe & Northern docks showed an increase for the season of nearly 2,000,000 tons, with shipments of 6,421,034 tons. The Great Northern docks at Superior loaded out 4,572,045 tons against 4,471,883 tons last year.

From the present outlook operators are estimating the season's shipments around 45,000,000 tons. Demand for ore from the eastern furnaces is claimed to be showing good improvement, and it is expected that shipments from several of the open-pit mines will be speeded up in the near future.

Stripping operations are being pushed by the Oliver Iron Mining Company at the North Forty at Hibbing, and with the development of a substantial demand for manganiferous ores, good activity is being shown on the Cuyuna range. The labor situation is satisfactory on the ranges, with plenty of men available.

Court Upholds Removal of Town So Iron Deposits May Be Mined

The Supreme Court of Minnesota has sustained the findings of the District Court which authorized the vacation of the streets of the old townsite of Hibbing, Minn., on the Mesabi range, in order that the iron ore which underlies the tract may be mined. It is also held that the owners of the two adjoining tracts to the south of the old townsite are not entitled to compensation for the vacation of the streets.

The litigation has been generally referred to as the "North Forty Case," and it was on this tract that the business section of old Hibbing was located.

The underlying iron ore is controlled by the Oliver Iron Mining Company, the mining division of the United States Steel Corporation. When the time came that it desired to mine this ore, the company spent \$3,500,000 for the surface rights and the removal of the village.

It is estimated that there are 20,000,000 tons of ore under the ground involved and about 13,000,000 tons in the adjacent slopes. The ore set free by the proposed development will afford employment for a good many years to a large number of men.

Minnesota Occupational Tax

Important Cleveland and Pittsburgh shippers of Lake Superior iron ore have begun suit in the Minnesota Supreme Court against the state tax commission's collecting the occupational tax, which runs into hundreds of thousands of dollars. This proceeding promises to become famous in midwestern legal history.

Utah Now Home of Biggest Silver-Lead, Single Unit Operating in the World

Consolidation of silver mining properties at Park City during May makes Utah the home of the biggest single silver-lead mining company in the United States.

The deal involves the properties and assets of the Park-Utah Mining Company and the Park City Mining & Smelting Company and included the control of the Ontario Silver Mining Company and the Daly Mining Company. The holdings include 4,300 acres of rich mineral land in the Park City mining district, which extend to Brighton, a distance of 9 miles to the east. The new company will be known as the Park Utah Consolidated Mines.

The properties employ 925 workmen, with a monthly payroll of \$130,000 or \$1,500,000 a year for wages alone.

The board of directors of the new company will include the following: J. O. Elton, general manager of the International Smelting Company, Salt Lake City; Moylan C. Fox, Salt Lake; Adolph G. E. Hanke, New York City; G. W. Lambourne, president of the two companies, Salt Lake; Chas. Lange, Cincinnati, Ohio; Otto Luedeking, Cincinnati; and William Wraith, Anaconda Copper Mining Company, New York City.

President Lambourne will remain in active charge under the consolidation.

It is rumored that Joseph J. Walsh, of Wilkes-Barre, Pa., may become a candidate for appointment as director of the United States Bureau of Mines. It is understood that Mr. Walsh has the support of Governor Pinchot, of Pennsylvania.

Try Out New Smelting Method

A new method of smelting copper ores is to be tested out by A. W. McGregor, a well-known designer of smelting plants, at the smelter of the Calumet and Arizona Mining Company, at Douglas, Ariz. A retort is to be placed alongside of one of the furnaces, and it is planned to use the pyritic ores in doing their own smelting, using their natural heat for this purpose. A mechanical stoker will be employed to keep the surface of the mass agitated as it is drawn down into the retort, to keep it stirred and mixed so the sulphur will be enabled to give its greatest heat to the point of total consumption. Thus it is planned to take advantage of the natural heat in the sulphurous content, and to make the mass practically self-smelting.

Ask Highest Court to Review Copper Furnace Decision

The American Smelting & Refining Company has asked the United States Supreme Court to review the decision of the Ninth Circuit Court of Appeals in the case against George Campbell Carson, involving patents on side feeding of reverberatory copper furnaces. The smelting company lost in the lower court. The case is a test, and the decision will affect all smelters.

Automobiles in Open-Pit Mining at United Verde

An initial fleet of four electric trucks is being tried out in the steam-shovel mining at the United Verde Copper Company, Jerome, Ariz. This is said to be the first use of automobile trucks in large operations to take the place of railroad tracks and cars. The trucks, each of four-yard capacity, haul the rock to the mine raise nearest to the point of loading. The longest haul is not more than 500 feet. Results are declared to be very satisfactory, eliminating costly track-laying and switching operations.

Magma Copper Joins Research Association

William A. Willis, manager of the Copper and Brass Research Association, has announced that the Magma Copper Company has become a member of the association. Action to this effect was taken at a recent meeting of the board of directors of the company. The New Haven Copper Company has also taken a membership in the association, which now represents more than 90 percent of the copper producing industry and about 90 percent of the copper, brass and bronze fabricating industry.

Georgian Manganese Corporation

The Georgian Manganese Corporation of New York has been organized to take

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over the contract recently made by W. A. Harriman & Company, with the Soviet Government and private mine owners, to operate the Russian manganese properties located in the Caucasus.

Charles L. Holman, president of the Laclede Gas Light Company, St. Louis, has resigned to accept the presidency of the corporation.

Efforts Resumed for Establishment of Mines Department in California

The Department of Mines of the Sacramento Chamber of Commerce is now laying plans to insure the passage of an act, at the next session of the California legislature, creating a State Department of Mines and Minerals. This effort failed recently when Governor Richardson refused to sign the bill passed by the legislature.

Oil Shale Experimental Plant, Colorado

Work preliminary to the erection by the United States Bureau of Mines of an experimental oil shale plant on the Naval Oil Shale Reserve in Colorado is well under way. It is intended to demonstrate at this plant the actual costs of mining, retorting and marketing shale and shale products, and to furnish information which will enable private enterprises to proceed with development on a large scale, after practical demonstration of the results.

M. J. Gavin, of the Bureau of Mines, recently returned from abroad, where he visited all the shale activities in operation in Scotland and France, and will proceed to Colorado to assist in the work there.

Mr. Gavin states that the Scottish shale industry has just had its most successful year since the war, producing approximately 3,000,000 barrels of crude oil at the mine retorting plant. To give some idea of the size of this industry in Scotland, Mr. Gavin said that there are about 40,000 persons dependent on the mining, retorting and refining of oil shale in that country. Scottish shales yield an average of 24 U. S. gallons of crude oil per short ton, and about 36 pounds of ammonium sulphate.

Oil shale activities in France, Mr. Gavin said, are centered in two places—Autun, southeast of Paris, and in Southern France in the Var Basin, near San Raphael. The industry at Autun was established in 1839, and retorts of the Scottish type are now being used. Activities at the other plant are on more or less of an experimental basis, he said.

American Petroleum Institute to Issue Report On Oil Resources

A report on oil resources of the country will be issued August 7 by the

American Petroleum Institute, covering particularly, future supply and demand. The Institute will give estimates of the volume of oil which may be expected from existing fields; indications as to probable discovery of new fields; methods of recovery of liquid fuels from oil shale, coal and lignites; calculations on future population and industrial growth; probable increase in number of automobiles and oil-consuming engines; and discussions of mechanical changes which will conserve oil through more efficient utilization. The report will consider the demand for the next 50 years.

Drilling for Oil Costly

More than 23 percent of all wells drilled for oil have been failures, according to a statistical bulletin issued by the American Research Foundation of Chicago.

"Drilling oil wells has cost \$12,000,000 since the beginning of the oil industry," says the bulletin, "and all the oil ever recovered has brought the producers only \$7,500,000,000. Eighty percent of wells drilled in wildcat territory never struck oil."

"Dry holes for the last few years have resulted in an average loss to operators of \$90,000,000 a year. Probably the costliest failure ever drilled was in California where a well that did not strike oil represented an investment of \$300,000. One company spent more than \$1,000,000 on five failures."

"The loot of stock promotion fakers who took the public's money and never drilled at all is a loss not figured in these estimates."

"Only companies equipped with scientific and thoroughly trained men have more than a fighting chance to win in a business that is becoming more costly each year."

Moffat Tunnel Half Completed

Work on the Moffat tunnel in Colorado is practically half complete. Boring through James Peak from both east and west, the two work gangs have completed over 16,000 feet of the water tunnel, which will total 32,382 feet when completed in January, 1926. Main headings for the road tunnel are half through the mountain, though the full-size enlargement has not been completed for all this distance.

I. C. C. Holds Lake Cargo Coal Rates Reasonable—Complaints Dismissed

The Interstate Commerce Commission has refused to alter in any respect the existing rail rates on bituminous coal from Pennsylvania, Ohio, Maryland, West Virginia, Virginia, Kentucky and Tennessee to Lake Erie ports for trans-

shipment by vessel to the Northwest, and has dismissed the complaints.

The commission held that after full consideration of the entire record it finds that the present rates do not exceed the maximum reasonable and are "not unduly prejudicial, unduly preferential or otherwise unlawful."

This involved proceedings, which has taken the name of the "Lake Cargo Coal Case," has attracted wide attention and brought forth arguments and protests from not only the complainants and defendants but from numerous coal associations, companies and Northwestern consumers and utility commissions, who became parties to the proceeding in the capacity of intervenors.

The original complaint was filed on July 10, 1923, by the Pittsburgh Coal Producers' Association, who charged that the rates from their mines to Lake Erie ports were too high as compared with rates from southern districts.

The various complainants were not, of course, united in their allegations of unreasonable, prejudicial and preferential rates. Operators in the Pittsburgh and Ohio fields charged that the rates accorded producers of coal in Southern West Virginia, Kentucky and Tennessee were too low, and worked to the detriment of and encroached upon their markets, while the latter asked that more favorable rates be accorded them. Defendant railroads were divided in the same way. Consumers in the Northwestern states supported the operators in West Virginia, Kentucky and Tennessee, declaring that coal from that section was best suited to their requirements.

Following the submittal of the examiners' report, and after the commission's announcement of the institution of the general rate investigation, under the Hoch-Smith law, petitions were filed by the West Virginia, Kentucky and Tennessee operators for a rehearing of the case, citing the declarations made in the Hoch-Smith law that in adjusting freight rates the commission shall take into consideration "the conditions which at any given time prevail in our several industries * * * to the end that commodities may freely move."

Argument for and against further hearing, and upon the examiners' report, was held in Washington, April 27, 28, and 29. The commission declined to reopen the proceedings, but stated that the evidence introduced at this hearing would be considered in the final determination of the case.

The commission's decision differs from the recommendations of the examiners, the latter having suggested new rates based on differentials more favorable to coal operators in Pennsylvania and Ohio fields.



WITH THE MANUFACTURERS



A McKinlay coal mining and loading machine, which was recently installed at the new mine of the Illinois Coal Corporation, at Nason, Jefferson County, Ill., started work Monday, June 22, 1925, and is referred to in the following from Mr. Joseph D. Zook, vice-president of said company, from their Chicago office, under date of June 23, to-wit:

"I have a very satisfactory report which came in this morning, showing that on yesterday they were able to advance ten feet (10 ft.) in a very few minutes. There are several adjustments yet to be made, but everyone seems to be completely satisfied with the showing already made. They have been feeding the machine into the coal at the rate of 3½ inches per minute.

"They expect to make a record run today and no doubt I will have a complete report on my desk tomorrow morning."

The machine above referred to is practically a duplicate of the machine which has been operated at Kentenita, Ky., by the Fordson Coal Company for the past six or seven months.

T. V. Buckwalter, who has been Chief Engineer for the Timken Roller Bearing Company, was made vice-president in charge of engineering at the July meeting of the directors of the company.

Plans have been formulated for the electrification of the Detroit Rock Salt Company, Detroit. Electric motors and control for use in both mine and mill are to be installed. The application of electricity to this mine follows the general policy recently established by the International Salt Company, which is gradually electrifying its various subplants, one of which, the Retsof Salt Company, was completed two or three years ago.

Salt will be removed from the mines by a skip hoist, operated by a 600 horsepower induction motor. Nine induction motors, ranging in rating from 5 to 75 horsepower, will drive the tipple, where the salt is cleaned, prepared, etc. Complete electrical equipment, including the necessary switchboard will be furnished by the General Electric Company. All control for the tipple will be arranged for remote operation, utilizing pushbutton starting.

An interesting feature of the equipment is the fact that all control devices will be immersed in oil, this being nec-

essary as a result of the very high corrosive action of the salt dust suspended in the air. It was found practically impossible to keep out the salt by making the equipment dust-proof, inasmuch as the dust is so fine that it partakes more of the nature of a gas than of a dust. The practice of immersing control equipment in oil in such cases is now being generally followed by the General Electric Company, except where ideal conditions are encountered.

Robert Miller has been appointed manager of the Rocky Mountain sales district of the General Electric Company, succeeding Harry D. Randall, who is on leave of absence because of ill health. B. J. Wheatlake succeeds Mr. Miller as local office manager at Salt Lake City, and Mr. Randall has been assigned to special duties at the general office of the company in Schenectady. Mr. Miller's headquarters will be in Denver.

Gerald Swope, president of the General Electric Company, made an announcement in regard to the orders for the quarter and half-year ending June 30.

Orders received by the General Electric Company for the three months ending June 30 amount to \$66,468,992, compared with \$71,219,984 for the same period in 1924, a decrease of 7 percent.

For the six months of the present year, orders total \$150,315,228, compared with \$144,707,887 for the first half of 1924, an increase of 4 percent.

Link-Belt Publishes New Book on Coal and Ashes Handling Methods

Link-Belt Company have just announced the publication of a new 68-page book describing new methods for handling coal and ashes in boiler houses.

The book is beautifully illustrated; showing installations of the Peck carrier in the boiler houses of many public buildings, such as the new Tribune Tower in Chicago, and in many industrial plants throughout the United States.

It also contains much data of interest to engineers and architects, and is of particular value to anyone interested in boiler houses and their equipment. The Peck carrier is also used for handling cement, sand, ore and other materials.

A copy will be mailed upon request. Address Link-Belt Company, Chicago, Indianapolis or Philadelphia.

Bulletin No. 11, on Classification and Washing just has been released by The Dorr Company. The bulletin contains 20 pages, is completely illustrated, and gives a wealth of information concerning Dorr equipment for Classification and Washing. It specifically describes the Dorr Classifier Model C 20; Model D, the Dorr Bowl Classifier, the Dorr Multideck Classifier, and gives detailed information concerning action of these Classifiers in handling various minerals.

The Automatic Operation of Centrifugal Pumps is the title of a new 24-page bulletin issued by Barrett, Haentjens & Company, Hazleton, Pa. The publication describes methods used to make centrifugal pumps start, stop and run without constant attention, and shows how various automatic control devices can be used to insure protection against damage to the pump due to loss of water, suction air leaks and other operating difficulties. The subject is treated in both a popular and a strictly technical manner so that the principles involved can be easily grasped by both engineers and practical operating men.

Copies of this bulletin will be gladly furnished upon request to Barrett, Haentjens & Company, Pine and Buttonwood Street, Hazleton, Pa.

The Osgood Company, Marion, Ohio, have released a new publication, Bulletin No. 256, featuring the Osgood ¾-yd Power Shovel and its combinations. This machine just recently has been placed on the market. The bulletin deals with gasoline, oil and electric power shovels, is fully illustrated with photographs and drawings, and gives complete information concerning this type of equipment. Copies sent upon request to the home office, Marion, Ohio.

General Electric Company has issued a bulletin especially devoted to Mine Locomotives—trolley type—gathering, and explaining special features of that line of their equipment, and emphasizing equalized leaf spring, electric breaking and improved cable reel.

The installation, operation and maintenance of switchboards is fully covered in a new 120-page booklet, paper bound, issued by the General Electric Company. This booklet, bearing the number 87000-E, is profusely illustrated with photographs, diagrams, tables, formulas, etc.

It contains much varied information of especial value to those engaged in the construction, installation and maintenance or operation of switchboards.

The Hisey-Wolf Machine Company, Cincinnati, Ohio, manufacturers of Portable Electric Machine Tools, has issued a new Bulletin, No. 1306, dealing with the new "Hisey" Heavy Duty Grinder, which is equipped for 18-inch diameter by 3-inch Face Grinding Wheels. They announce that the price of this machine is \$395 f. o. b. Cincinnati. Full information and copies of bulletin may be obtained upon request to the Cincinnati office.

The Esterline-Angus Company, Indianapolis, Ind., have issued a bulletin dealing with Speed Recording and Indicating Instruments, which is fully illustrated and which gives complete information concerning their line of equipment. Copies may be had upon request for Bulletin 725, addressed to their Indianapolis office.

W. A. Jones Foundry & Machine Company announce opening of offices at 614 Builders Exchange, Minneapolis, Minn., under direction of F. S. Van Bergen, District Sales Manager, who will take care of territory covered by Minnesota, North and South Dakota, and parts of Iowa and Wisconsin adjoining Minnesota.

This office will handle the sales of the entire Jones line, including Speed Reducers, Friction Clutches, Gears, Iron Pulleys, Flexible Couplings, Line Shaft Equipment and Miscellaneous Power Transmission Specialties.

HIGHEST AERIAL TRAMWAY

THE highest aerial tramway in the world, having a total length of more than five miles, is in use by the Caracoles Tin Company, Bolivia, for transporting ore from the workings to the mill. The mine is located on the upper eastern slope of the Andes Mountains near the headwaters of the Amazon River, at an altitude varying from 15,000 to 17,000 feet above sea level, while the mill is in the valley below, at an altitude of between 11,000 and 12,000 feet.

Two cables, suspended from steel towers, are used, one stationary over which the buckets move, and the other moving, for controlling the movement of the buckets. The tramway is broken up into two sections, both operated from a transfer station located where the two meet. Buckets travel at intervals of approximately 1,000 feet apart and are moved down, after starting, by the weight of the ore which they contain. Empties are returned on the same con-

tinuous cable, moved by the weight of the down-going buckets.

The cableway is controlled from the transfer station. General Electric equipment is used for this purpose, a 35 horsepower, 900 r. p. m., slip ring, back geared induction motor being utilized for starting. After starting, the motor floats on the line and acts as a brake on the regenerative braking principle, to prevent excessive speeds. A solenoid load brake is also used for emergency stopping.

The mine itself is not electrified, the veins being too small to allow room for such equipment, although electric lights are used in some of the main tunnels. Motor driven air compressors supply compressed air for drills in the mine and the prime movers which furnish power to the mill and mine are hydro-electric. The air compressor motors and the generating equipment is all of General Electric manufacture, with the exception of one French generator.

NATION'S VIEWPOINT

(Continued from page 412)

in foreign countries and to the maintenance of open channels for necessary supplies. The conditions to be met are so varied that probably it is impossible now to devise any comprehensive, precise and workable plan of internationalization for the future. At best, any general scheme of control now worked out would lack the elasticity and effectiveness of the present procedure based primarily on private initiative. In time such a plan may be evolved, empirically, from the sum total of international experience in this field. Perhaps about as much as could be done now in this direction would be to give international affirmation to the general principle of the open-door policy, which is after all the core of the problem, leaving the specific procedure to be worked out as circumstances require."

During the last session of Congress "a superpower trust" was a term that became familiar to the ears of the American public. Just how little there is in that phrase was demonstrated in a recent article in *Financial News* by Guy E. Tripp, of the General Electric Company, entitled "Government Ownership Not Essential for Power and Light Development." In part, Mr. Tripp said:

"Since water power has for years been deemed to be a natural resource to be conserved for the benefit of the people, it furnishes an additional reason for the growing interest of the public in the electric power problem. Therefore, it is not surprising that we find as one of the principal issues

of the present campaign the question of public versus private ownership of superpower systems.

"I cannot, at this time, go very deeply into an argument of this question; but not even the most hearty advocate of government ownership in this country has, or can, claim that private enterprise is not doing this work in a satisfactory manner. The American electric power industry is conceded by everyone to be highly progressive and has, in fact, regularly anticipated the growth of the country. Especially is this true of superpower development. Superpower systems were well along in the process of formation in several sections of the country before the legislators and newspapers even knew the meaning of the name, and they are today expanding with a rapidity that is literally astounding the people.

"Government ownership is, therefore, not necessary for electric development in the United States. Indeed the proponents of government ownership of superpower systems do not rest their case upon any dissatisfaction upon the progress which has been achieved by private interests.

"The arguments for government ownership can be easily demolished from a logical standpoint, but logic is not what supports the case for public ownership; it is really founded upon apprehension—a fear that such a great public national service in the hands of private capital would acquire so great a power that it could not be prevented from exploiting the public by means and ways impossible to control.

"The reply to that is that the present system of regulating public service corporations has been proven to be sound; and if any objectionable practices still remain they can be readily remedied.

"In any event, I repeat that the development of superpower under the driving force of private interests in the United States is today far ahead of the rest of the world. Private interests here recognized the necessity of this development long before it was recognized in other countries where government ownership of utilities as a policy prevails to a large degree. With our own eyes we have seen the industry in this country grow from nothing to a point where it has become one of the most vital factors in the welfare of the nation. As a result of ceaseless effort on the part of the best minds from your profession, supported by the courage of our financiers, the industry has been developed to a point which involves an investment of at least ten billion dollars as a conservative estimate."

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The Lunkenheimer Co., Cincinnati,
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AUTOMATIC CAR CAGES
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G. M. Johnson Mfg. Co., Jeannette,
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G. M. Johnson Mfg. Co., Jeannette,
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**BATTERIES (Storage, Gas
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Prest-O-Lite Co., 30 East 42nd St.,
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BATTERY SCREENS
Ludlow-Saylor Wire Co., 608 S.
Newstead Ave., St. Louis, Mo.

BEARINGS (Roller)
Hyatt Roller Bearing Co., Harrison,
N. J.

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Jeffrey Mfg. Co., 958 N. Fourth St.,
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Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

BELTING, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd.,
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Morse Chain Co., Ithaca, N. Y.
Weller Mfg. Co., 1820-56 N. Kostner
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Link-Belt Co., 300 W. Pershing Rd.,
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Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

BIT SHARPENERS
Ingersoll-Rand Co., 11 Broadway,
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BLACK DIAMONDS
R. S. Patrick, Sellwood Building,
Duluth, Minn.

BLASTING POWDER
Hercules Powder Co., 934 King St.,
Wilmington, Del.

BLASTING SUPPLIES
du Pont Powder Co., The E. I.,
Wilmington, Del.

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Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

CABLES
American Steel & Wire Co., Chicago
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**CABLES (Connectors and
Guides)**
American Mine Door Co., Canton,
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CABLEWAYS
Jeffrey Mfg. Co., 958 N. Fourth St.,
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Lidgerwood Mfg. Co., 96 Liberty
St., New York City.

CAGE (Safety Appliances)
Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

CAGERS, AUTOMATIC
G. M. Johnson Mfg. Co., Jeannette,
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CAGES

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Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

G. M. Johnson Mfg. Co., Jeannette,
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Lidgerwood Mfg. Co., 96 Liberty
St., New York City.
Traylor Engineering & Mfg. Co.,
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Ave., Chicago, Ill.

CAR WHEEL BEARINGS

Hyatt Roller Bearing Co., Harrison,
N. J.

CASTINGS

Jeffrey Mfg. Co., 958 N. Fourth St.,
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Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

CHAIN RAIL CAR HAULS

G. M. Johnson Mfg. Co., Jeannette,
Pa.

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Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
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Morse Chain Co., Ithaca, N. Y.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

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Link-Belt Co., 300 W. Pershing Rd.,
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Exchange, Chicago, Ill.

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Ludlow-Saylor Wire Co., 608 S.
Newstead Ave., St. Louis, Mo.

CLAMPS (Trolley)

Ohio Brass Co., Mansfield, Ohio.

CLUTCHES

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

COAL COMPANIES

General Coal Company, Land Title
Bldg., Philadelphia, Pa.
Lehigh Coal & Navigation Co.,
Philadelphia, Pa.
Thorne, Neale & Co., Philadelphia,
Pa.
Bertha-Consumers Company, Cham-
ber of Commerce Bldg., Pitts-
burgh, Pa.

COAL CRUSHERS

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.
Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

COAL CUTTERS

Goodman Mfg. Co., Halsted St. and
48th Pl., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway,
New York City.
Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

COAL HANDLING MA- CHINERY

Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.
Lidgerwood Mfg. Co., 96 Liberty
St., New York City.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

COAL LOADERS

Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

COAL MINING MACHIN- ERY

Goodman Mfg. Co., Halsted St. and
48th Pl., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway,
New York City.
Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.
Weller Mfg. Co., 1820-56 N. Kostner
Ave., Chicago, Ill.

COAL MINING PLANTS

Ingersoll-Rand Co., 11 Broadway,
New York City.
Jeffrey Mfg. Co., 958 N. 4th St.,
Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd.,
Chicago, Ill.

COAL SCREENS

Ludlow-Saylor Wire Co., 608 S.
Newstead Ave., St. Louis, Mo.

COCKS (Locomotive, Cyl- inder and Gauge)

The Lunkenheimer Co., Cincinnati,
Ohio.

COKE SCREENS

Ludlow-Saylor Wire Co., 608 S.
Newstead Ave., St. Louis, Mo.

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Allis-Chalmers Mfg. Co., Milwau-
kee, Wis.
Ingersoll-Rand Co., 11 Broadway,
New York City.

COMPRESSORS, MINE CAR

Ingersoll-Rand Co., 11 Broadway,
New York City.

CONCENTRATING PLANTS

Taylor Engineering & Mfg. Co.,
Allentown, Pa.

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Taylor Engineering & Mfg. Co., Allentown, Pa.**CONVEYOR BEARINGS**

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

CONVEYORS, CHAINJeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Fawcett Machine Co., Pittsburgh, Pa.

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Ludlow-Saylor Wire Co., 608 S. Newstead Ave., St. Louis, Mo.

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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CRUSHERS (Gyratory)

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CRUSHERS, SINGLE & DOUBLE ROLL

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DESIGNERS OF PLANTS

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Hoffman Bros., Punxsutawney, Pa.

DIAMOND DRILLING CARBON

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DRILLS (Blast Hole)

Ingersoll-Rand Co., 11 Broadway, New York City.

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Hoffman Bros., Punxsutawney, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

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Hoffman Bros., Punxsutawney, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

Keystone Churn Drill Co., Beaver Falls, Pa.

New York Engineering Co., 2 Reader St., New York City.

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Ingersoll-Rand Co., 11 Broadway, New York City.

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Ingersoll-Rand Co., 11 Broadway, New York City.

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Morse Chain Co., Ithaca, N. Y.

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du Pont Powder Co., The E. L. Wilmington, Del.

Hercules Powder Co., 334 King St., Wilmington, Del.

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Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

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General Electric Co., Schenectady, N. Y.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Traylor Engineering & Mfg. Co., Allentown, Pa.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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FLOTATION OILS

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General Electric Co., Schenectady, N. Y.

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Oxweld Acetylene Co., 30 E. 42nd St., New York City.

FORGINGS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

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FURNACES (Copper, Lead, Blast)

Traylor Engineering & Mfg. Co., Allentown, Pa.

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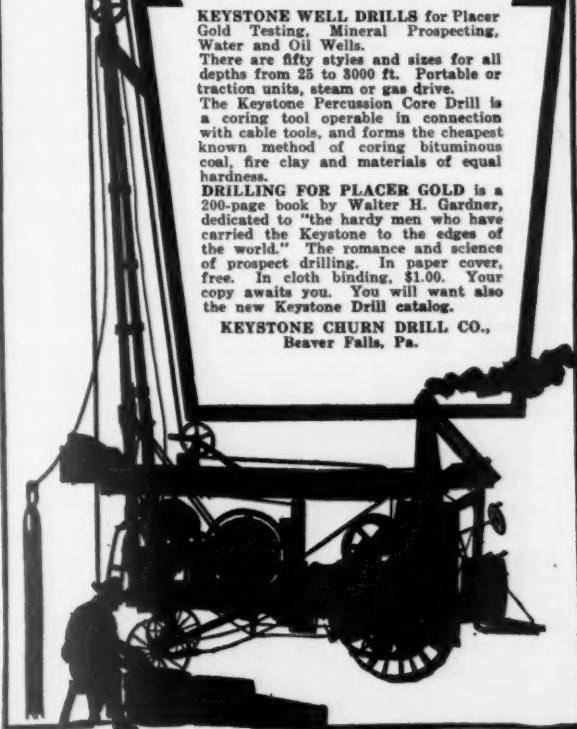
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GAS (Nitrogen, Oxygen)

Linde Air Products Co., 30 E. 42nd St., New York City.

GAUGES, WELDING

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Fawcett Machine Co., Pittsburgh, Pa.

GEARS, HERRINGBONE

Fawcett Machine Co., Pittsburgh, Pa.

GEARS, SILENT CHAIN

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

GEARS, SPUR

Fawcett Machine Co., Pittsburgh, Pa.

GEARS, WORM

Fawcett Machine Co., Pittsburgh, Pa.

GEARS, WORM WHEELS

Fawcett Machine Co., Pittsburgh, Pa.

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GENERATORS, ACETYLENE

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GLOVES, ASBESTOS

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GOOGLES, WELDING

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

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Ohio Brass Co., Mansfield, Ohio.
Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Ohio Brass Co., Mansfield, Ohio.

HERRINGBONE GEAR DRIVES

Fawcett Machine Co., Pittsburgh, Pa.

HOIST DRIVES

Fawcett Machine Co., Pittsburgh, Pa.

HOISTS

American Steel & Wire Co., Chicago and New York.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Lidgerwood Mfg. Co., 96 Liberty St., New York City.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

HOISTS, PORTABLE

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Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTS, STEAM

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

Lidgerwood Mfg. Co., 96 Liberty St., New York City.

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Lidgerwood Mfg. Co., 96 Liberty St., New York City.

HOISTING ROPES

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HOSE, WELDING

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Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Third Rail)

Ohio Brass Co., Mansfield, Ohio.

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Ohio Brass Co., Mansfield, Ohio.

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Roebling Sons, John A., Trenton, N. J.

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Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

LOADING BOOMS

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

LOCOMOTIVES, RACK RAIL

Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

LOCOMOTIVES, STORAGE BATTERY

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

MANIFOLDS, OXYGEN

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MILLS, ROD & BALL

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Taylor Engineering & Mfg. Co., Allentown, Pa.

MILLS, STAMP

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Taylor Engineering & Mfg. Co., Allentown, Pa.

MILLS (Tube)

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MINE DOORS, AUTOMATIC

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, O.

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John Boyle, Jr., Ouray Bldg., Washington, D. C.

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Hercules Powder Co., Wilmington, Del.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

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Hercules Powder Co., 934 King St., Wilmington, Del.

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, O.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

PREHEATING APPARATUS

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

PROSPECTIVE DRILLS

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Hoffman Bros., Punxsutawney, Pa.

Ingersoll-Rand Co., 11 Broadway, New York City.

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Weller Mfg. Co., 1820-56 N. Kostner Ave., Chicago, Ill.

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Aurora Pump & Mfg. Co., Aurora, Ill.

Ingersoll-Rand Co. (A. S. Camerer Steam Pump Works), 11 Broadway, New York City.

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Aurora Pump & Mfg. Co., Aurora, Ill.

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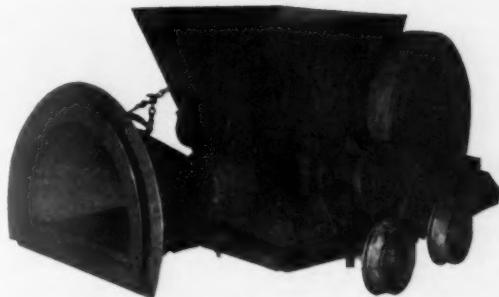
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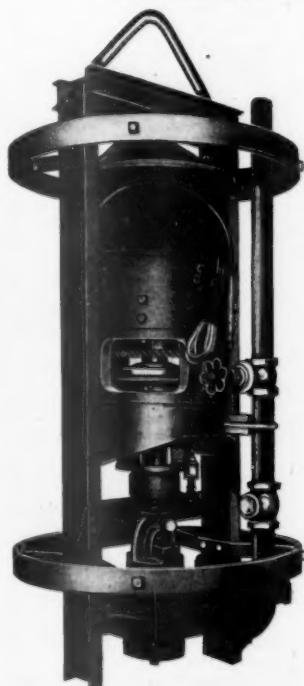
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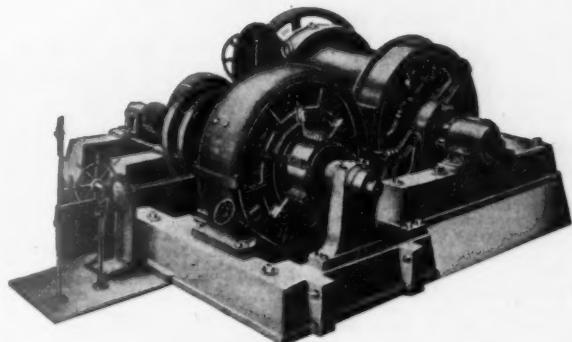
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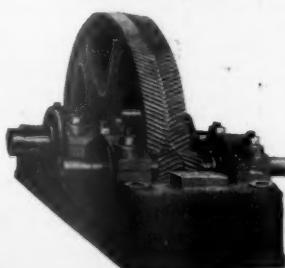
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R. L. Kingsland, Genl. Supt., Power and Mechanical Dept., Consolidation Coal Co., Fairmont, W. Va.

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The Nubian Giant

QNCE there was a simple hearted Nubian giant who came out of the marshes to live in the settled places of the earth. He was of great age but such was his virility that his strength increased with his years. Having lived so long alternately in the water and under the blistering sun, his skin and even his flesh was as black as ebony.

¶ At first men feared him and would have exorcised him for an evil spirit but he won their hearts by his kindly smiles and patient work. He could turn their mills faster than the wind and water together and after a day of labor he asked only a dinner and a truss of straw upon which to sleep. He would pull all of their wagons to the city even when they were piled high with the produce of the countryside. As he became accustomed to the ways of the city, he studied to make the people happy. He spun a new machine called a dynamo so fast that the sparks from it lighted the whole city and even spun the little fans before which men cooled themselves in summer.

¶ One day a great war arose and all the men went away to fight. Wanting to make sure that the giant would remain at home and work for them, they put him in chains and even set certain of their number to watch him. And, they being proud to be the master of a giant, saw fit to scourge him. From that day, the face which had smiled upon everyone became sad and the heart which had been merry knew what it meant to regret. The Nubian giant was sick and the people had to look for another to do their work.

¶ Moral: Ingratitude—even to the coal industry—was never a proper reward for faithful service.



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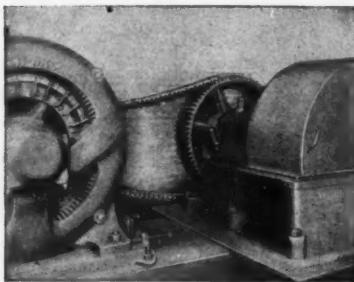
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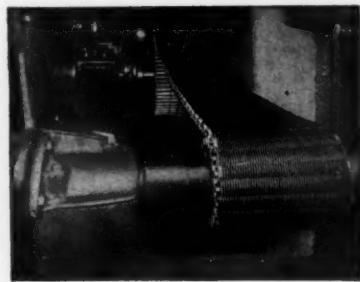


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